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Embedded Instruction to Support Early Learning in Response to Intervention Frameworks

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A major purpose of instruction in early childhood education is to provide sufficient experiences and opportunities for preschool children to learn skills that facilitate their access to and participation in a preschool curriculum, their attainment of desired developmental and learning outcomes, and their readiness for school. Two sources have had significant influence on practices used in early childhood education programs: 1) developmentally appropriate practices (DAP) disseminated by the National Association for the Education of Young Children (NAEYC; 2009), and 2) the Division for Early Childhood's (DEC) recommended practices for early intervention/early childhood special education (Sandall, Hemmeter, Smith, & McLean, 2005). Both sources are intended to serve as guidelines for the application of recommended practices, including practices related to teaching and instruction.

When DAP guidelines were first disseminated in 1986, questions were raised about whether the practitioner's identified role as a guide or facilitator for child-initiated and child-directed learning experiences was sufficient for addressing the instructional needs of children with learning challenges or those with disabilities (e.g., Carta, Schwartz, Atwater, & McConnell, 1991; Wolery, Strain, & Bailey, 1992). For early learning experiences and opportunities to be maximally beneficial, some asserted, a central role for practitioners was to influence the interactions children have with activities, peers, adults, toys, and materials in preschool environments. Systematic efforts to influence child–environment interactions were characterized as *interventions*, particularly when interventions involved intentional teaching strategies carried out in the context of activities in the preschool classroom and as part of practitioners' ongoing interactions with children (Wolery & Wilbers, 1994).

Successive updates to the DAP guidelines in 1996 and 2009 have emphasized the importance of both child-initiated and teacher-guided learning experiences and opportunities (NAEYC, 1996, 2009). The 2009 DAP position statement emphasizes the importance of *intentionality* in teaching. As stated in the DAP position statement,

> A hallmark of developmentally appropriate teaching is intentionality. Good teachers are intentional in everything they do—setting up the classroom, planning curriculum,

> making use of various teaching strategies, assessing children, interacting with them, and working with their families. (2009, p. 10)

The 2009 DAP guidelines emphasize instructional quality and effectiveness. *Intentional* teachers are defined as those who are purposeful and reflective about actions they take in their teaching in support of the instructional or learning goals that the early childhood education program is trying to help all children, and each child, reach.

With respect to recommended practices of the DEC, the 27 child-focused practices are particularly relevant for the present chapter. These practices provide guidance about how children should be taught, when and where instructional practices and arrangements should be implemented, and how children's learning and development should be monitored to inform data-based decision making (Wolery, 2005). The DEC child-focused recommended practices reflect accumulated empirical evidence emphasizing that children at risk for learning challenges or those with identified disabilities benefit from intentional, differentiated, and systematic teaching and instruction. Consistent with tenets expressed in the 2009 DAP position statement, DEC child-focused practices emphasize the importance of intentional interactions and instruction by adults who interact with young children to support their development and accelerate their learning toward desired outcomes.

In addition to DAP guidelines and DEC recommended practices, preschool curricula, state early learning guidelines and standards, and accountability practices have informed practitioners' decisions about what children should know and be able to do as well as how instruction should be implemented. Across these sources is recognition that teaching and instruction should be intentional and differentiated using a variety of strategies.

Response to intervention (RTI) frameworks are useful for organizing and integrating practices related to what will be taught and how it will be taught. Achieving desired results or learning outcomes for young children in the context of RTI frameworks should be inextricably linked to the application of evidence-informed and differentiated teaching and instructional practices that have been shown to support early development and accelerate learning (Snyder, McLaughlin, & Denney, 2011).

Within RTI frameworks, decisions about the types and intensities of instructional strategies are informed by analyses of child-environment "fit" to support learning and development. Where there is a lack of fit, intentional and systematic instructional strategies are implemented to alter the learning environment or the child's capacity to interact with the environment. Responses to child–environment fit involve instruction being delivered along a continuum from less structured to highly structured. The type and intensity of instruction is informed by data related to children's capacities for meeting environmental or learning task expectations and by examining children's responses to the learning opportunities they are provided.

Embedded instruction is an evidence-informed approach to intentional and systematic instruction that aligns well with early childhood RTI instructional principles and practices. Embedded instruction focuses on 1) specifying the instructional content to be taught, 2) identifying when this content should be taught, 3) using intentional and systematic instructional procedures to teach specified content, and 4) evaluating whether instruction is implemented as planned and results

in child learning as part of data-informed decision making. Initially developed as an approach for teaching young children with identified disabilities, embedded instruction can be used to support the learning and development of young children within RTI frameworks (VanDerHeyden & Snyder, 2009).

The purpose of this chapter is to consider how embedded instruction would be used within RTI frameworks. We begin the chapter by defining embedded instruction. The empirical evidence related to embedded instruction is reviewed briefly to set the context for descriptions of each component of embedded instruction and the practices associated with each component. We illustrate how these components and associated practices could be applied in RTI frameworks, with particular emphasis on the component related to using intentional and systematic instructional procedures. We discuss treatment intensity as a way to consider the dose of embedded instruction provided to young children within RTI frameworks. The chapter concludes by identifying future directions for embedded instruction research and practice.

DEFINING EMBEDDED INSTRUCTION

Embedded instruction is a multicomponent approach for planning, implementing, and evaluating instruction. It is one variant of several naturalistic instructional approaches that have been described in the early intervention/early childhood special education literature (Snyder et al., 2012). It involves providing instruction on children's priority learning goals (referred to as learning targets) during typically occurring activities, routines, and transitions. This approach to intentional instruction is distinguished by an emphasis on providing learning opportunities to young children that are embedded rather than decontextualized. The instructional strategies used vary on a continuum from less to more structured but are intentional and systematic.

Embedded instruction is related to naturalistic instructional approaches that have been described in the early intervention/early childhood special education literature since at least the late 1960s. Beginning with the seminal work of Hart and Risley (1968, 1974, 1975), which focused on incidental teaching, several naturalistic instructional approaches have subsequently been described and examined (e.g., milieu teaching, enhanced milieu teaching, activity-based intervention, embedded instruction, naturalistic teaching; Snyder et al., 2012). Despite different labels, each of these instructional approaches involves the use of teaching and instructional strategies that provide learning opportunities in typically occurring activities and routines.

Several common features have been identified across the various naturalistic instructional approaches, including embedded instruction (Horn & Banerjee, 2009; Rule, Losardo, Dinnebeil, Kaiser, & Rowland, 1998; Snyder et al., 2012). First, the contexts for instruction are children's typically occurring activities, routines, or everyday learning experiences. Second, the content of instruction focuses on learning targets or skills needed by the child to meet activity expectations or characteristics, participate in typically occurring activities and routines, demonstrate competence with respect to early learning curricular standards or guidelines, or achieve desired child developmental or learning outcomes. Third, each instructional episode is child-initiated or initiated by an adult based on the child's focus

of attention or interest, and a natural or logically planned consequence follows the child's response. Fourth, the adults who implement the instruction are those who interact regularly with the child.

EMPIRICAL EVIDENCE FOR EMBEDDED INSTRUCTION

Naturalistic instructional approaches, including embedded instruction, have empirical support. Findings from 44 studies reported in 38 articles published from 1981 through 2009 have shown that these approaches are effective for teaching young children at risk or those with disabilities a variety of functional, developmental, and school readiness skills, including language, adaptive, literacy, and social skills. In addition, systematic instructional procedures (e.g., naturalistic time delay, least-to-most prompting) have been implemented with fidelity as part of these approaches (Snyder et al., 2012). Use of naturalistic instructional approaches, including embedded instruction, has been demonstrated to support children's participation in the general preschool curriculum while addressing individualized learning and instructional needs.

Embedded instruction would be considered a "practice" as defined by the What Works Clearinghouse (2010, p. 4) because it is "a named *approach* [emphasis added] to promoting children's development that staff implement in interacting with children and materials in their classroom." In the Snyder et al. (2012) review, 15 studies either explicitly identified the naturalistic instructional approach examined as embedded instruction or included intervention features that were consistent with the definition of embedded instruction used in the review. Across the embedded instruction studies, the instruction focused on learning targets related to a range of content areas for child learning (i.e., preacademic, communication, social, motor, cognitive, and adaptive skills) and the embedded instruction involved a range of instructional strategies to facilitate child learning (e.g., environmental arrangements, curricular modification, mand/model, antecedent-based strategies, feedback strategies, time delay, response prompting). All studies examined children's acquisition of skills, whereas about one third examined skill generalization and one third examined skill maintenance.

IDENTIFYING KEY COMPONENTS OF EMBEDDED INSTRUCTION

The studies identified as part of the Snyder et al. (2012) review were analyzed to identify practices included as part of the naturalistic instruction intervention. Fourteen practices were identified from the reviewed studies. The practices identified were subsequently organized under four key components: 1) what is taught, 2) when it is taught, 3) how it is taught, and 4) how embedded instruction is evaluated in relation to instructional quality and effectiveness for children.

A validation panel composed of researchers, curriculum specialists, professional development experts, practitioners, and family members verified and made recommendations about both the components and practices (Snyder, Hemmeter, Sandall, & McLean, 2008). The validation panel made suggestions about how to describe and clarify the key components and practices for practitioners. Based on panel recommendations, Snyder et al. (2008) subsequently used four heuristic labels under which the 14 practices were organized: 1) what to teach, 2) when to teach, 3) how to teach, and 4) how to evaluate. Table 18.1 shows each of these components

and associated practices. Each component of embedded instruction and the associated practices will be described further. We discuss how these components and practices might be implemented in the context of RTI frameworks, with particular emphasis on the *how to teach* component.

What to Teach

Four key practices are shown in Table 18.1 related to what to teach: 1) develop high-quality activities, 2) use activity-focused assessment, 3) break instructional goals down into teachable learning targets, and 4) develop high-quality learning targets. What to teach involves identifying instructional content and specifying learning targets for all children, a group of children, or an individual child. Descriptions of what young children should know or be able to do as specified in early learning standards or guidelines often influence the content focus of instruction as well as teaching and instructional practices used in early education and care settings. Cultural, historical, institutional, and political forces influence views about what skills, knowledge, and abilities are considered important instructional content in early learning standards or guidelines (Scott-Little, Kagan, & Frelow, 2006).

The *what to teach* component of embedded instruction is based on a premise similar to a core premise of RTI, which is that the core curriculum provides children with opportunities to be engaged and to learn during activities that are motivating, developmentally appropriate, and challenging for a range of diverse learners (Greenwood, Bradfield, Kaminski, Linas, Carta, & Nylander, 2011). High-quality activities provide opportunities to address priority learning targets in logical and appropriate contexts.

When determining what to teach, assessment during ongoing activities can be used to analyze child–environment "fit" and identify activities where there is a lack of fit. In an activity-focused assessment, children are observed during ongoing activities and routines. Behaviors and skills used by the majority of children

Table 18.1. Intervention components and practices identified in embedded instruction literature

Component	Practice
What to teach	Develop high-quality activities.
	Use activity-focused assessment.
	Break instructional goals down into teachable learning targets.
	Develop high-quality learning targets.
When to teach	Develop an activity matrix based on a balanced classroom schedule.
	Select activities that are a good fit for embedded learning opportunities given the specified learning target.
	Distribute embedded instruction learning trials within and across activities.
How to teach	Use intentional and systematic instructional procedures.
	Implement complete learning trials.
	Use massed, spaced, or distributed learning trials.
	Align instructional procedures with the learning target behavior.
How to evaluate	Evaluate fidelity of implementation. (*Am I doing it?*)
	Evaluate child outcomes. (*Is it working?*)
	Use data-informed decision making. (*Do I need to make changes?*)

Practices listed were examined in Snyder, Hemmeter, Sandall, and McLean (2007) and were recommended by a validation panel (Snyder, Hemmeter, Sandall, & McLean, 2008).

to participate in the activities and routines are noted. If one or more children have difficulty participating, their level of participation and present skill level within or across activities or routines are noted. Information gathered during an activity-focused assessment can be used to inform the development of learning targets. Activity-focused assessment is similar to activity-based or curriculum-based assessment (Cook, 2004; Macy, Bricker, & Squires, 2005). It is an appropriate complement to universal screening or progress-monitoring procedures used as part of RTI frameworks (VanDerHeyden, 2005).

Once an activity-focused assessment has been conducted, instructional goals and associated learning targets can be identified. Often, instructional goals are broad statements of skills or behaviors that the activity-focused assessment suggests are important to improve child–environment fit. For example, an activity-focused assessment might reveal that a child rarely initiates interactions with peers even though the characteristics or expectations of many activities in the preschool classroom involve peer-to-peer interactions. If almost all children engage in peer-to-peer interactions during classroom activities and the activity-focused assessment suggests that child–environment fit would be improved for a small number of children or an individual child if peer-to-peer interaction skills were improved, then peer-to-peer interaction skills might be identified as an appropriate embedded instructional goal. The instructional goal is broken down further into a learning target.

Learning targets are written as part of the *what to teach* component of embedded instruction. A learning target is a behavioral objective. It specifies the skill, the conditions under which the skill will be used, and the criteria for determining when the skill is acquired, mastered, or generalized. Skills specified in learning targets should be observable, age-appropriate, functional, and generative (Grisham-Brown, Hemmeter, Pretti-Frontczak, 2005; Notari-Syverson & Schuster, 1995; Snyder, McLaughlin, et al., 2009). The quality of written learning targets has been linked to the quality of embedded instruction learning opportunities practitioners provide to young children (Pretti-Frontczak & Bricker, 2000; Snyder et al., 2011).

The skill specified in a learning target is a proximal instructional priority to improve child–environment fit and to support engagement and learning in ongoing activities, routines, or transitions. In the context of an RTI framework, the skill specified as part of a learning target aligns with skills specified in early learning content standards or guidelines and the preschool curriculum. For children with identified disabilities, the learning target skill also would align with the child's individualized education program (IEP) goals, benchmarks, or short-term objectives.

When to Teach

Embedded instruction involves intentional and systematic instruction implemented during activities, routines, and transitions. Contextualized learning opportunities have been linked to increases in children's motivation (Dunst, 2000; Dunst & Bruder, 1999) and generalization and maintenance of learned skills or behaviors (Horn, Lieber, Li, Sandall, & Schwartz, 2000; Losardo & Bricker, 1994; Venn, Wolery, Werts, Morris, DeCesare, & Cuffs, 1993). Three key practices shown in Table 18.1 are related to when to teach: 1) develop an activity matrix based on a balanced classroom schedule, 2) select activities that are a good fit for embedded learning

opportunities given the specified learning target, and 3) distribute embedded instruction learning trials within and across activities.

An activity matrix is developed that reflects a balanced classroom schedule. A balanced classroom schedule includes a mix of teacher-directed and child-initiated activities and opportunities for children to experience large-group, small-group, and individualized instruction, if needed. In addition, a balanced schedule provides opportunities for children to alternate between activities or routines that primarily involve attending or group participation with those that involve active child participation or movement. A balanced classroom schedule extends the importance of developmentally appropriate activities and core curriculum emphasized as part of the *what to teach* component.

An activity matrix shows the balanced classroom schedule and is used to plan when instruction on learning targets will occur for all children, for targeted groups of children, or for an individual child. On an activity matrix, planning teams identify activities that are a good fit for embedded learning opportunities, based on the learning target skill(s). The matrix specifies the number of learning trials for each learning target within and across each activity.

To select activities that are logical and appropriate for embedded instruction, the "fit" between the activity expectations and the learning target skill are considered in relation to key information about the child, including current abilities, preferences, and support needs. For example, a teacher might select art activities and writing activities as logical and appropriate opportunities for children to practice writing their names. Moreover, a teacher might create a computer sign-in system or plan for sidewalk chalk to be available during outdoor play to provide additional opportunities for children to practice writing their names. The activities the teacher has selected or created provide logical and appropriate opportunities for children to write their names. In contrast, asking children to write their names during routines such as hand washing generally would not be considered logical or appropriate. In the previous example, the teacher identified two existing logical and appropriate opportunities for children to write their names. To ensure sufficient and varied learning opportunities, the teacher *created* two additional activities during which it would be logical and appropriate for children to write their names. Identifying logical and appropriate opportunities to teach learning target skills helps specify the planned dose of embedded instruction for all children, some children, or individual children. To quantify dose, the activity matrix shows when embedded instruction learning trials will be provided; how many learning trials are planned for each activity, routine, or transition; and the children for whom the trials will be provided.

How to Teach

Practices related to how to teach reflect instructional strategies ranging from universal design for teaching and learning to the use of specific and precise instructional procedures. As part of embedded instruction, the instructional strategies are implemented within and across activities, routines, and transitions. The strategies use or build upon existing environmental or discriminative stimuli that are part of an activity, routine, or transition and set the occasion for learning target skill responses to be followed by naturally occurring or logically planned consequences. Four key practices are shown in Table 18.1 related to how to teach: 1) use

intentional and systematic instructional procedures; 2) implement complete learning trials; 3) use massed, spaced, or distributed learning trials; and 4) align instructional procedures with the learning target behavior.

Instructional procedures are used to characterize the interactions among teachers, children, and the environment during a teaching or learning episode. A variety of "named" instructional procedures have been described in the embedded instruction literature (e.g., environmental arrangements, mands, models, response prompting, response shaping). The extent to which these instructional procedures exert influence over a child's interactions during the teaching or learning episode varies (Wolery & Schuster, 1997). For example, constant time delay (Doyle, Wolery, Gast, Ault, & Wiley, 1990; Schuster, Griffen, & Wolery, 1992) outlines a highly structured interaction to ensure "errorless" learning, and a series of decision rules are used to guide interactions during the teaching or learning episode. In contrast, environmental arrangements are a less structured instructional strategy that might involve the use of within-stimulus or extra-stimulus cues that set the occasion for responding (VanDerHeyden, Snyder, DiCarlo, Stricklin, & Vagianos, 2002).

In their embedded instruction approach, Snyder et al. (2007) have emphasized complete learning trials rather than specific instructional procedures such as time delay or most-to-least prompting. This emphasis does not suggest that specific instructional procedures such as time delay are not used as part of embedded instruction; rather, it emphasizes that all instructional trials involve three or four primary features. A complete embedded instruction learning trial includes a sequence of 1) antecedent, 2) learning target behavior (skill), and 3) consequence. In addition, a prompt or correction might occur as part of the complete learning trial when the target skill is not emitted or is incorrect. By focusing on complete learning trials as part of an embedded instruction approach, the occurrence of trials and the components of these trials can be reliably observed and documented. Counting and analyzing the components of complete learning trials helps practitioners and researchers quantify the dose of embedded instruction learning trials children are receiving on priority learning targets (Snyder, Hemmeter, et al., 2011).

Instructional learning trials can be massed or spaced within an activity or distributed within or across activities. Decisions about whether to mass, space, or distribute learning trials are based on the child's phase of learning in relation to the target behavior, the type of learning target specified, and the need to adjust intervention intensity.

Massed trials refer to instructional learning trials in which the same target behavior is elicited repeatedly with very little time between trials. Massed trials are appropriate for learning target behaviors that emphasize repetition, or they might be used when the child is acquiring or becoming fluent with a skill. For example, massed trials might occur when a child is identifying objects, naming pictures, or stacking one object on top of another.

Spaced trials involve longer intervals between trials (e.g., more than 3 seconds) and provide opportunities for the learner to pause or engage in a different behavior before the next targeted learning trial occurs. Spaced trials typically are used when learning target behaviors occur frequently during an activity, routine, or transition and when the child is acquiring or becoming fluent with a skill. Examples of learning target behaviors for which spaced trials might be appropriate are scooping

food from a bowl using a spoon, taking successive drinks from a cup, and placing objects in defined spaces (e.g., puzzles).

Distributed trials are learning trials in which instruction focused on a learning target is interspersed with one or more other skills within or across an activity, routine, or transition. In distributed trial instruction, there is a longer time between instructional trials during which the child can engage in other behaviors. For example, during snack time, it would be logical to distribute trials for a learning target focused on using two-word utterances to request "more." Distributed trials generally are appropriate when a child has acquired or is fluent with a skill, and maintenance as well as generalization of the learning target behavior across people, settings, or materials is desired. In addition, distributed trials often are used when it is logical or appropriate for the learning target behavior to occur only once or twice within an activity or across activities. For example, it might only be logical and appropriate for a child to practice skills related to putting on a coat when going outside to play or leaving school at the end of the day.

How to Evaluate

Practices associated with what to teach, when to teach, and how to teach involve planning and implementing instruction. *How to evaluate* focuses on examining whether embedded instruction is implemented as planned and whether it results in child learning, and this information is used to inform data-based decision making. As shown in Table 18.1, three key practices are associated with how to evaluate: 1) evaluate fidelity of implementation, 2) evaluate child outcomes, and 3) use data-informed decision making. These three key practices have been framed as questions to help practitioners answer three questions: 1) Am I doing it? 2) Is it working? and 3) Do I need to make changes? These three questions are used as part of *how to evaluate* to provide a framework for data-informed decision making (Snyder et al., 2007).

The first practice (*Am I doing it?*) focuses on fidelity of embedded instruction implementation. This includes evaluating whether 1) the planned number of embedded instructional learning trials within and across activities were implemented, and 2) the learning trials implemented were complete instructional learning trials. Implementation fidelity data might include how many learning trials occurred for a learning target, when learning trials occurred for a learning target, and whether implementation resulted in complete learning trials. The second practice (*Is it working?*) focuses on monitoring child progress and learning in relation to the learning target skill. Monitoring of child progress occurs during ongoing activities, routines, and transitions in the classroom or during activity-focused assessments, not in decontextualized "testing" situations. The third practice (*Do I need to make changes?*) focuses on examining both implementation fidelity and child progress or learning data to determine whether changes are needed either in embedded instruction implementation or in the learning target(s) being addressed.

APPLYING EMBEDDED INSTRUCTION IN THE CONTEXT OF RESPONSE TO INTERVENTION FRAMEWORKS

Embedded instruction can be used in RTI frameworks by differentiating or "tiering" instruction. Decisions about the types and intensities of instruction to be used are

based on analyses of child–environment fit to support learning and development. When there is a lack of fit, instruction occurs to alter the learning environment or the child's capacity to interact within the environment. Instructional decisions are made through direct measurement of learning opportunities and child responses to these opportunities in order to identify the type, specificity, and intensity of instruction needed to optimize child–environment fit. Operationalized decision criteria are used to evaluate whether instruction is associated with desired learning outcomes or if more intensive instruction is needed for some children or individual children. Emphasis is placed on conducting activity-focused assessment to identify priority learning targets, using progress monitoring measures to quantify child learning, and measuring fidelity of implementation of instructional strategies. In a child–environment fit approach to embedded instruction, instructional learning targets are defined based on the gap between what the child can do and what is expected of the child in a particular task or activity in a certain setting (VanDerHeyden & Snyder, 2009). Instruction is designed to build skills or modify the task or environment.

Embedded instruction components and associated practices, which we have described as what to teach, when to teach, how to teach, and how to evaluate, can be used across RTI tiers and can support other RTI activities. Embedded instruction, when used as part of Tier 1 interventions, occurs in the context of core instruction being provided to all children. With respect to what to teach, instructional content would be aligned with early learning content standards and curricular frameworks. Developmentally appropriate activities and a balanced schedule would be the context for embedded learning opportunities. Universal design, curricular modifications, environmental arrangements, and naturalistic instructional procedures would often be used to support the implementation of embedded learning trials. The dose of embedded instruction provided for some children or for individual children would vary based on several contextual features (e.g., the structure of the "core curriculum" activity or routine, the number of staff available to provide intentional or systematic instruction during ongoing activities and routines, or the learning targets specified for some children or for an individual child). When embedded instruction practices are used as part of Tier 1 instruction, children generally need to be able to respond to less precise instruction and to natural cues and consequences. Embedded instruction implemented at Tier 1 would likely require fewer instructional trials for children to reach the desired criteria on their learning targets, and child responses to logically occurring antecedents and consequences would more often be correct or approximations to the target behavior rather than absent or incorrect.

Within targeted or Tier 2 interventions, embedded instruction would often include more and more precisely implemented learning trials in the context of ongoing activities, routines, and transitions. This would include more systematic instructional procedures, increases in the number of learning opportunities provided, and planned increases and decreases in task or activity difficulty. Skill acquisition and building fluency through practice and through increasing motivation to practice in relation to a learning target behavior would be emphasized. Opportunities to respond would occur in the context of activities or routines that often are more structured or adult-directed or involve smaller numbers of children to ensure instructional pacing and available contingencies. More frequent monitoring of embedded instruction implementation fidelity and child learning would occur.

For individualized or Tier 3 interventions, embedded instruction typically would focus on direct, discrete, and precise instruction in the context of ongoing activities, routines, and transitions, often following a "scripted" instructional plan. Learning targets would be taught with systematic response prompting or shaping procedures, and available contingencies would be those identified as reinforcing for the learner. Skill acquisition and building fluency through repeated practice and through increasing motivation to practice in relation to a learning target skill is emphasized, similar to Tier 2. In Tier 3, however, instructional content as reflected in the learning target skill often is focused on "critical skills." Critical skills are behaviors that when acquired set the occasion for new learning or more rapid learning of other skills (Wolery & Hemmeter, 2011). Examples of skills that have been identified as critical for preschool children to learn in classroom contexts include imitation, initiating interactions, joint attention, and object manipulation. Adherence to an instructional protocol or script would be evaluated, and frequent monitoring of child learning would occur.

Figure 18.1 illustrates criteria that might be used to inform decisions about embedded instruction learning trials within Tier 1, 2, or 3 interventions. As this figure illustrates, often the specificity and dose of embedded instruction learning trials differ across tiers. In addition, this figure shows relationships between screening, progress monitoring, activity-focused assessment, and measurement of implementation fidelity and embedded instruction implementation.

TREATMENT INTENSITY AND EMBEDDED INSTRUCTION

As noted by Wolery and Hemmeter (2011), additional empirical data are needed with respect to when embedded instruction learning trials should occur, how frequently trials should be inserted, how much spacing should occur between trials, how many trials should be provided per activity or day, and the number of activities in which instruction should occur to promote child learning. These issues involve treatment intensity. Warren, Fey, and Yoder (2007) suggested the need for systematic lines of research focused on this topic. As Warren et al. noted, very limited empirical literature exists on differential treatment intensity for any practice in

Embedded Instruction			Screening	Progress monitoring and activity-focused assessment	Measurement of implementation fidelity
	Tier 1	• Responds to less precise instruction • Responds to more natural cues • Responses are more often correct • Requires fewer trials to criterion			
	Tier 2	• Requires more systematic prompt hierarchies • Requires more gradual increases and decreases in task difficulty • Requires more trials to criterion			
	Tier 3	• Requires acquisition-level instruction for prerequisite skills • Requires explicit support to generalize • May require very well controlled instructional trials to establish skills			

Figure 18.1. Criteria to help inform decisions about embedded instruction learning trials within a response to intervention framework. (Adapted from VanDerHeyden, A. [2009, October]. *Technically adequate RTI implementation.* Presentation at the first annual RTI early childhood summit, Albuquerque, NM, and Snyder, P., & Wilcox, J. [2009, October]. *The promise and challenge of RTI in early childhood.* Presentation at the first annual RTI early childhood summit. Albuquerque, NM. Copyright 2010 by Patricia Snyder and Amanda VanDerHeyden.)

early childhood education, including embedded instruction. To advance research related to treatment intensity, Warren et al. proposed terminology for the measurement of intervention intensity by defining and describing five terms: 1) dose, 2) dose form, 3) dose frequency, 4) total intervention duration, and 5) cumulative intervention intensity. We consider how these terms might be useful for advancing conceptualizations and specification of embedded instruction treatment intensity and future research to inform instruction-focused decision criteria within RTI frameworks.

Warren et al. (2007) defined *dose* as "the number of properly administered teaching episodes during a single intervention session" (p. 71). This involves measuring fidelity of implementation and three subcomponents: 1) length of intervention session, 2) average rate of teaching episodes (frequency of episodes per unit of time), and 3) distribution of episodes over the session. For example, as part of a 20-minute mealtime routine for all children, if a teacher provided five embedded instruction learning trials approximately every 4 minutes focused on using two-word phrases to request "more," the rate is one episode every 4 minutes and episodes are distributed approximately equally across the session.

Turning to dose form, Warren et al. (2007) suggested this term be used to describe the task or activity in which the teaching episodes are delivered. For example, teaching episodes focused on generalized imitation skills might be delivered in a highly structured one-to-one format in the context of an adult-directed activity. Alternatively, the dose form for the mealtime learning target focused on using two-word phrases to request "more" might be delivered in core preschool activities and routines.

Dose frequency was defined by Warren et al. (2007) as the number of times a dose of intervention is provided per day or per week. This might be one of the more difficult dimensions of treatment intensity to quantify, particularly in inclusive classroom settings when doses of systematic instruction are likely to be distributed throughout the day. Nevertheless, strategies for planning when instruction occurs using forms such as activity matrixes or embedded instruction plans (e.g., Sandall & Schwartz, 2002, 2008; Snyder, Sandall et al., 2009) might be useful for planning and documenting dose frequency.

Warren et al. (2007) defined total intervention duration as the time over which a specified intervention is presented. They noted that cumulative intervention intensity is the product of dose × dose frequency × dose duration. These authors suggested several research studies that might be conducted to examine systematically these various dimensions of treatment intensity. To conduct these studies, it would be important to specify an instructional episode for a given content-focused intervention "in a way that allows an episode to be observed and counted" (p. 72). Although acknowledged as challenging work, the approaches Warren et al. suggested for measuring treatment intensity might hold particular promise for quantifying treatment intensity when embedded instruction is used within RTI frameworks.

In the context of embedded instruction, Snyder, Crowe, et al. (2009) have quantified the intensity of embedded instruction learning trials provided to young children with disabilities in inclusive preschool classrooms using a measure known as the Embedded Instruction Observation System (EIOS). Given that RTI levels or tiers are distinguished by the intensity or specificity of the intervention, it seems reasonable to suggest that a future trend in embedded instruction research might

focus on intensity and specificity of instructional trials using the differential treatment intensity framework suggested by Warren et al. (2007).

FUTURE DIRECTIONS IN EMBEDDED INSTRUCTION RESEARCH AND PRACTICE

In addition to treatment intensity, several other directions in embedded instruction research and practice need to be addressed to realize fully the promise of this approach within tiered frameworks. Contemporary perspectives from prevention science related to adaptive prevention–intervention frameworks hold particular promise for future developments in the application of embedded instruction. In contrast with frameworks in which the composition and dose of intervention components associated with each tier is fixed, adaptive frameworks assign different doses of intervention across different groups or individuals based on decision rules that link characteristics of the learner with specific levels and types of intervention components (Collins, Murphy, & Bierman, 2004). Adaptive frameworks appear to hold particular promise with respect to considering different doses of instruction on priority learning targets.

Use of an adaptive perspective would ensure instruction is not categorized solely by a tier and instruction does not move in a linear fashion from one tier to the next in either an ascending (increasing intensity) or descending (decreasing intensity) sequence. Rather, adaptive frameworks promote decision making about how much support or instruction a young child needs with a specific skill at a specific time given a specific context with consideration for the child's phase of learning (Sandall, Schwartz, & Joseph, 2001; VanDerHeyden & Snyder, 2009). Particularly for young children at risk for or with disabilities, decisions about dose or differential instructional intensity often are based on individual characteristics, needs, and values using an evidence-based practice framework (Buysse & Wesley, 2006; Snyder, 2006; Winton, 2006).

Additional research is needed to provide clearer guidance and decision rules about which embedded instruction components and associated practices should be implemented for which children, under what circumstances, and for which learning targets. Promising work related to specifying the key components and associated practices for embedded instruction has been conducted (Snyder, Hemmeter, et al., 2011). Preliminary data exist to support the premise that when preschool teachers are provided with professional development comprised of workshops, coaching, and resources to support implementation, they are able to implement the practices associated with key components of embedded instruction with fidelity, particularly the components related to what to teach and how to teach. In addition, the average number and procedural accuracy of instructional learning trials provided to preschool children with disabilities during ongoing classroom activities, routines, and transitions increases (Snyder, Hemmeter, et al., 2011). Nevertheless, important questions remain to be addressed, such as 1) whether embedded instruction is more or less effective for certain types of learning target behaviors (e.g., dispositions, response classes, behavior chains, discrete responses; Wolery & Hemmeter, 2011); 2) whether generalization of learning target behaviors occurs when embedded instruction procedures involve systematic attention to motivating operations across people, activities, or materials; and 3) when to increase or decrease embedded instruction

treatment intensity. Each of these questions and others that might be addressed in future research necessitate addressing challenges related to measuring fidelity of implementation, quantifying intensity, and monitoring child learning.

SUMMARY

Embedded instruction is a multicomponent approach that includes a continuum of instructional strategies to support active participation and meaningful learning in the context of activities, routines, and transitions that occur regularly in the preschool classroom. Within RTI frameworks, embedded instruction is viewed as multitiered and differentiated instruction on learning targets that might not otherwise be addressed with sufficient intensity or specificity for all children, some children, or individual children to support or accelerate their progress toward desired learning outcomes. Embedded instruction components and associated practices can be used across RTI tiers using an adaptive perspective and data-based decision making to inform instructional intensity. For the promise of embedded instruction to be realized within tiered intervention frameworks, evidence available to date suggests practitioners must be supported to implement embedded instruction practices with fidelity and to apply appropriate decision-making criteria to their evaluations of intervention fidelity and instructional effectiveness.

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