Chapter 10
Universal Design for Learning and Technology in the Early Childhood Classroom

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Abstract Instructional technology (IT) integration hinges on several principles: (a) the technologies should align well with the curriculum, (b) the choice of technology should be based on how well the tool serves classroom learning and teaching needs, and (c) teachers must ensure opportunities for all children to participate and learn in the technology-rich environment. To serve the needs of all young children in a technology-supported curriculum, a framework known as "universal design for learning" (UDL) proves helpful. Early childhood curricula that employ UDL principles are proactive and designed to provide young children with multiple means of (a) engagement, (b) action and expression, and (c) representation. Varying strategies and materials are used in assessments, goals, curricula content, the classroom environment, instructional methods and materials, and interactions with children. Technology use affords early childhood education professionals the opportunity to create such accessible classroom settings. This chapter explores the relationship between information literacy, technology literacy, and universal design for learning in early childhood education. Vignettes illustrating practical classroom applications are presented.

Keywords Early childhood · Universal design for learning · Technology integration · Readily-available technology · Diversity · Inclusion · Response to Intervention (RtI)

Shatoya is a young child enrolled in preschool who has been identified as having a developmental delay and a vision impairment on her IEP. She enjoys interacting with her peers, but sometimes has difficulty communicating needs or commenting during play activities. The other students in the class like her and are always willing to help her with classroom tasks she needs to complete. Shatoya seems to like to listen to other children during literacy activities, particularly those that involve the computer. She also appears to like activities that emphasize beginning sounds, though she sometimes becomes frustrated when she doesn't understand what is taking place in these emergent literacy activities, and, on those occasions, will cry or become angry. When placed in a group setting, she is sometimes distracted by other children and their work and will stop working on her own assigned task. Shatoya

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often has a 5- to 10-s delay before she responds to instructions. She enjoys performing various classroom duties, especially those that have multi-step directions or numerous materials that have to be organized before completing the assigned task. Unfortunately, Shatoya's distractibility interferes with her completion of these duties. The teacher has begun using a classroom schedule to help children decide what activity is next and where the students are to go for each activity; however, Shatoya has trouble seeing the schedule. She enjoys participating in emergent reading activities, but she cannot see the words in the books.

Today's early childhood learning environments are undergoing rapid change due, in large part, to the presence of technology. Integration of technology into the classroom can help address the complex and diverse needs of children like Shatoya. Most education professionals working with young children once believed that technology was suspect as a characteristic of developmentally-appropriate practice (DAP), i.e., it could interfere with active learning that needs to take place in child-centered early childhood programs that provided authentic learning activities (National Association for the Education of Young Children 1996). Even today, many early childhood education professionals frequently perceive technology to support "passive activity" at best, and, at worst, to be an inhibiter to meaningful engagement in rich play and social activities essential to children's development. More innovative twenty-first century education professionals, including library media specialists, who work with young children, now have an expanded and more accepting understanding of the role of technology in today's classroom settings.

New personalized technologies such as tablets and smartphones, wireless technology, and technologies associated with software development and the Internet have not only revolutionized the relationship that education professionals have with technology, but these current and emerging tools have become an active part of young children's play and learning in the home and school (Parette 2011). Young children are exposed to technology early in industrialized nations (Parette et al. 2013b; Peurling 2012; Simon and Nemeth 2012) and, even before entering kindergarten, have learned to navigate and interact with websites, apps, and other types of technology. Child-friendly touchscreen interfaces, in particular, have made it easier for young children to have direct and meaningful contact with many technologies. The presence and use of technology by today's young children is increasingly being driven by the marketplace. For example, more than 60 % of apps used on hand-held devices are directed at young children (Shuler 2009; Travers and More 2013).

In addition to supporting play and social activity in the home, the personalized nature of technology has made parents and education professionals much more comfortable with their use in the daily lives of children; it also has increased interest in finding innovative uses to better educate children (Parette and Blum 2013a; Peurling 2012; Simon and Nemeth 2012). In fact, the expansion and personalization of readily-available technology that is integrated into children's daily life has now been considered developmentally-appropriate practice or DAP (National Association for the Education of Young Children (NAEYC) 2012; Parette and

Blum 2012; Parette et al. 2010). DAP means that activities and materials used in the delivery of the curriculum are individual appropriate, age appropriate, and socially and culturally appropriate (NAEYC 2009). This presents challenges to education professionals who must (a) make decisions about how technology is used in a developmentally-appropriate manner and (b) attend to how it may be effectively and efficiently connected to the curriculum using planned early childhood classroom activities that link learning standards and instructional objectives, instructional strategies, and assessment approaches (Parette and Blum 2013a). The ultimate goal of this connection is to ensure "meaningful" curricular access that supports diverse learners in early childhood settings. Universal design for learning (UDL) provides a framework to guide such curriculum development and implementation.

The Role of the Teacher in Fostering Inclusion

The attitudes and perceptions of teachers are consistently identified as important factors in the inclusion of children with disabilities (Avramidis et al. 2000; Brady and Woolfson 2008; Ernst and Rogers 2009; Hammond and Ingalls 2003; McGregor and Campbell 2001; Sze 2009). Too often, teachers and administrators focus on the disabilities of the child and respond reactively when a particular deficit interferes with the social or academic functioning of the child. Simply reacting to deficits and ignoring strengths is problematic. UDL is far more proactive—emphasizing strengths and eliminating barriers before they occur. A paradigm shift from deficit-reactive to ability-proactive can lead to academic and social success.

Kluth (2003) sees the role of the teacher as an educational leader and stresses how attitudes, beliefs, and the actions of teachers are crucial to the success of students in an inclusive environment. The teacher's perspective on his or her role in supporting the child with autism has a profound effect on the success of that child. Kluth (2003) suggests that educators make an attitudinal shift from seeing *differences* that pose difficulties as something that needs fixed or changed to fit the classroom environment to seeing *differences* as something to be desired and valued. Differences can serve as valuable assets on which to capitalize when planning for instruction and socialization. Fully recognizing the strengths, interests, and challenges of the individual requires the teacher to develop a supportive and authentic relationship with the child. Students know when and if the teacher believes they can learn and achieve (Kluth 2003). Even with the most positive, proactive attitudes and expectations, teachers can experience disappointment and frustration without thoughtful and appropriate planning for transition and sustained support.

The Role of UDL in Today's Early Childhood Classrooms

Early childhood education professionals have increasingly focused on the potential of UDL to help all young children participate in the curriculum (Lieber et al. 2008; Stockall et al. 2012; van Kraayenoord 2013). There are three major principles integral to the UDL framework: multiple means of (1) engagement, (2) action and expression, and (3) representation (Rose and Meyer 2002). Each of these principles has distinct implications for how technology is used and how learning is supported.

Engagement refers to how the design and delivery of a planned classroom activity can be used to (a) recruit the child's interest in the activity, (b) provide the child with multiple options for sustaining his or her effort and persistence, and (c) enhance the child's self-regulatory behavior. Children are motivated by many different types of activities. For example, some may prefer working individually, in a small group, or a whole-group setting. Some children will prefer more structure and teacher involvement in the classroom activity, while others will prefer greater independence, spontaneity, and opportunity for self.

Action and expression refers to varying the ways in which young children can express what they have learned during a planned classroom activity and/or through participation in other early childhood classroom settings. Some young children may be able to communicate well orally while others may prefer drawing. Young children not only vary in the means of expression that are most effective for them but also in terms of how comfortable they may be in expressing themselves in different settings (e.g., small group, large group, with a parent, different teachers, different children).

Representation refers to how the education professional and young children are allowed to present information and content in classroom activities. Children differ in the ways they perceive and comprehend information that is presented to them; thus, there is no single means of representation that will be effective for all young children. For example, children with physical disabilities, problem solving and organizational challenges, and language barriers all approach classroom learning tasks very differently. Multiple representations are used because they allow students to make connections within, as well as between, concepts.

In the most basic sense, UDL is a framework that guides decision making about curriculum design, instructional practices, and assessment strategies. Much of curricular design is targeted to a particular group of students and planned to deliver a specific type of content. Some curricula have been modified by special education teachers to meet the unique needs of young children. When UDL principles are applied to any curriculum, the goal is to maximize access that, in turn, creates meaningful learning outcomes for young children. One of the known benefits of applying UDL principles is that they can be used be used to create learning contexts that enhance children's interest in the curriculum as they acquire the knowledge and skills required for mastery of desired educational outcomes (Lieber et al. 2008).

But to better understand the implications of UDL and what it means for the early childhood education professional, the complexity of the classroom learning envi-

ronment must also be considered in the context of "systems" that are present. The following section presents an overview of the role of understanding systems in curriculum planning and implementation when UDL principles are being considered.

Technology Considerations and UDL When incorporating technology into any planned classroom activity, UDL principles should be an important consideration (Division for Early Childhood and the National Association for the Education of Young Children 2009). Parette et al. (2013b) noted that today's technologies "are flexible, digital, shared, dynamic, and interactive, and the use of such technologies aligns with UDL principles" (p. 10). When UDL principles are combined with these features of personalized technology in the classroom, leanners connect with the curriculum in ways that may have been previously limited. For example, when wireless Internet is connected to personalized devices and interactive whiteboards (e.g., SMART Board), opportunities are present to connect children with a global and culturally-diverse world.

Information and Technology Literacy

Information literacy refers to an individual's ability to find, retrieve, analyze, and use information (American Library Association 1997–2013; Heider 2009). Technology literacy refers to a set of skills wherein varying technologies are used to support learning, personal productivity, decision making, and daily life (International Society for Technology in Education n. d.). Given the exponential increase in both availability and use of personalized and readily-available technologies in our society, young children have unprecedented access to interactive technology which can help shape both their information and technology literacy development (Blum et al. 2011; Parette et al. 2010; Wartella et al. 2010). Use of smartphones, tablet devices, and personal computers—all of which are typically connected to the Internet—provide the potential of harnessing massive amounts of computing power that allows for global interaction and immense information being available to young children.

Tablet devices are portable and have touch interfaces that are particularly accessible to young children. Not only do such personalized technologies expand children's ability to interface with information in new ways (e.g., Internet and apps), but the twentieth-century format of traditional text-based books has morphed into an electronic, or "e-book" format, that has garnered considerable interest by education professionals, parents, and young children (Buckleitner 2011; Zucker et al. 2009). These books are now widely available and are typically either no- or low-cost to consumers. Parette et al. (2013a) recently conducted a features analysis demonstrating that "expert-rated" no-cost e-books frequently have many of the same features as low-cost e-books. However, they did note that the number of features alone should not be considered in choosing an e-book for young children; rather, the e-book's connection to learning goals, curriculum, and pedagogy are critical in any final evaluation of utility.

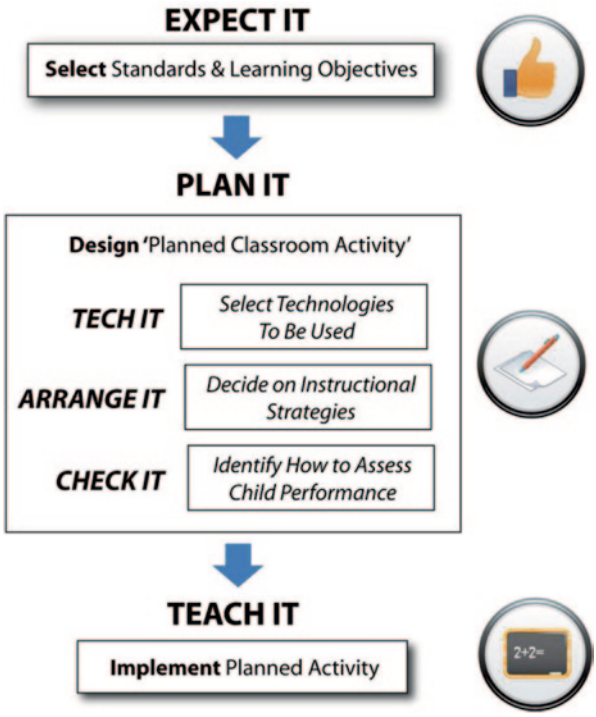

Fig. 10.1 EXPECT IT-PLAN IT-TEACH IT framework for technology integration in the early childhood classroom. (© 2013, H. P. Parette, & C. Blum. Used with permission)

EXPECT IT-PLAN IT-TEACH IT

Information and Technology Literacy

In order for young children to develop higher levels of information and technology literacy competence, they must use technology in play, during planned learning activities in the early childhood classroom, and at home. The EXPECT IT-PLAN IT-TEACH IT child-centered model of technology integration (Parette and Blum 2013; see Fig. 10.1) provides early childhood education professionals with a framework to support technology integration. A goal of using this framework is to support the development of information and technology literacy among young children. The framework is standards-based (EXPECT IT) and focused on developing and delivering child-centered planned activities throughout the day and at home.

One underlying issue when considering technology integration and information and technology literacy is decision making regarding what is developmentally appropriate (National Association for the Education of Young Children and Fred Rogers Center 2012). EXPECT IT should be connected to meaningful learning outcomes for young children. Further, planned activities should move beyond the engaging nature of technology alone. The National Education Technology Standards for Students (NETS-S) provide guidance for development of planned technology-

supported classroom activities which build literacy skills among young children (International Society for Technology in Education [ISTE] 2007).

There are six NETS-S standards that can be incorporated with any state early learning standards: (a) Creativity and Innovation; (b) Communication and Collaboration; (c) Research and Information Fluency; (d) Critical Thinking, Problem Solving, and Decision Making; (e) Digital Citizenship; and (f) Technology Operations and Concepts. In fact, it is not uncommon that states have either considered the NETS-S standards and blended them into their early learning standards or have a separate set of technology standards based on NETS-S. Each of the NET-S standards can be modified or clarified to develop an expectation in EXPECT IT that is developmentally appropriate.

Admittedly, young children are quite capable of key aspects of critical thinking essential to information and technological literacy (Epstein 2008). An example of how critical thinking can be supported is presented in the following vignette:

Ms. Corona instructs Carmen, a 5-year-old girl, in her pre-K classroom. In a joint parent conference with Carmen, Ms. Corona discovers that Carmen's favorite television show is 'Dog with a Blog.' Ms. Corona has surveyed the families in her class about their use of technology and media in the home. Ms. Corona asks Carmen's parents if their daughter is familiar with the Web site for the show. Carmen's parents have a laptop computer, but are unsure whether Carmen should have access to it. Ms. Corona explains that Carmen uses the classroom computer regularly, and that the school has a partnership with the local community library down the street. A library media specialist visits the class weekly and works with the teachers and children at the community preschool. Ms. Corona also mentions that the school has a book and media fair where children can purchase books and learn about e-books and other Internet applications for young children that can be accessed at home. Ms. Corona has prepared a simple instruction sheet for Carmen to use at home. It has instructions for her parents on one side and visual instructions with simple words on how to search for 'Dog with a Blog' on the other side. Carmen can use the computer keyboard to independently type in 'Dog with a Blog,' and she knows how to find the correct link that leads her to the Web site for her show and the activities. Ms. Corona encourages her parents to do this with Carmen, talk about the activities she is doing, and even have a friend play with her.

The preceding vignette illustrates how Ms. Corona helps parents create opportunities for communication and collaboration (working with peers); research and information fluency (conducting a search); and technology operations and concepts (use of a Web site and laptop). It further illustrates how partnerships can be created, even in a community preschool with limited resources. It should be noted that keyboarding is not an objective but *incidental* to a technology-supported, planned classroom activity. Young children enjoy working with technology independently, including typing on the keyboard. In today's marketplace, there are keyboards designed specifically for young children, e.g., having large keys, color-coded keys, and enlarged print on keys; however, many young children are still capable of using the standard keyboard in technology-supported planned classroom activities. In activities that require use of a keyboard, young children may often need assistance

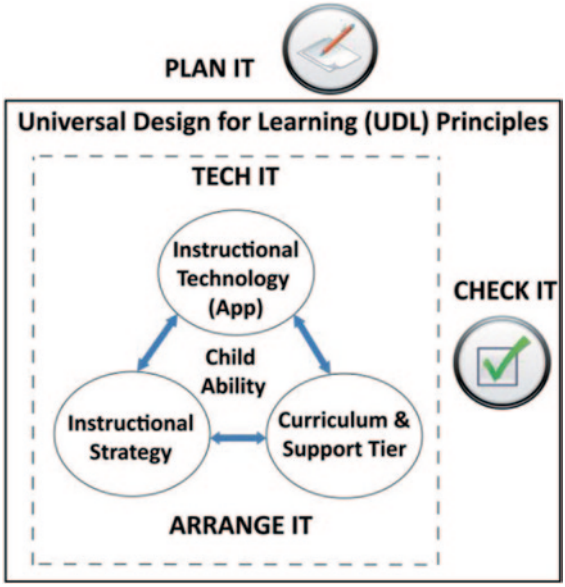

Fig. 10.2 PLAN IT: The dynamic relationship of TECH IT to instructional strategies, curriculum, and support tier (ARRANGE IT), and CHECK IT and Universal Design for Learning (UDL). (© 2013, H. P. Parette & C. Blum. Used with permission)

with letter identification in their initial keyboarding attempts. Sometimes the letters they learn in school look different than the text on the computer keyboard, or they may not have had enough repetitions to find a particular letter.

EXPECT IT helps the education professional identify the outcomes desired for the young child; PLAN IT is where technology integration planning occurs. *Intentionality* is a cornerstone of early childhood education (Copple and Bredekamp 2009). In other words, early childhood environments are not *random* play-engaging activities, but they are rich *child-centered* activities that create learning opportunities for young children. PLAN IT is a process that allows the early childhood education professional to specifically connect a classroom activity to EXPECT IT. It creates intentionality in how technology is used to support information and technology literacy. Using the EXPECT IT-PLAN IT-TEACH IT approach, the library media specialist may be focused on an activity in the library, or more likely, an activity within the classroom, or both. Young children learn much better when they interact with technology through play and exploration (Bischke et al. 2013; NAEYC and Fred Rogers Center 2012). Hence, focusing on the use of information and technology literary skills during center-based or other small-group learning activities is crucial. In the PLAN IT phase, the early childhood education professional and library media specialist must consider TECH IT (i.e., the selection of technology used in the planned activity), ARRANGE IT (i.e., the instructional strategies used in the activity), and CHECK IT (i.e., the assessment methods used to determine whether learning has occurred, see Fig. 10.2).

During PLAN IT, the education professional's attention is focused on the young child's ability and the developmentally-appropriate use of technology within the planned activity. An array of strategies can be incorporated to ensure EXPECT IT

is accomplished by young children in the learning environment. Common instructional strategies include various forms of scaffolding (e.g., prompting and signals), exploratory play, modeling, interactive discussions, problem solving (i.e., creating opportunities for it and guiding young children through it with scaffolding), and embedding technology within natural daily routines (e.g. using a SMART Board to check in for attendance; Blum and Parette 2013).

Other important considerations are (a) the curriculum and how the children are progressing when participating in its delivery and (b) available response to intervention (RtI) tier (Blum and Parette 2013). Many early childhood programs now employ some form of RTI wherein students who are at-risk or have identified individual needs have been screened (National Professional Development Center on Inclusion 2012). Consideration of the unique needs of these children is essential because it identifies areas for specialized instruction or needs for unique applications of technology to support children's participation in the curriculum.

Each of these considerations becomes part of the reflective thinking exhibited by the early childhood education professional and library media specialist as they plan a classroom activity or sets of activities. A final consideration is CHECK IT, the assessment component that is directly connected to EXPECT IT. There is an array of traditional assessment approaches and technology tools used to support assessment that are helpful to evaluate the instruction. The CHECK IT component is a four step process: (a) ask an evaluation question, (b) choose an evaluation strategy, (c) use the evaluation strategy in an authentic manner, and (d) make decisions based on the data (Meadan et al. 2013). Digital cameras, smartphones, and tablet computers enable instantaneous capture of children's use of information and technology literacy skills during planned classroom activities. Apps designed for use on tablet computers are particularly important given the increasing presence of the iPad in twenty-first-century early childhood classroom settings. One unique app is Educreations (Educreations, Inc. 2013), a free app having numerous UDL features that allows young children to upload pictures and drawings, as well as to draw and record their thoughts (Parette and Blum 2013b). Young children can import pictures found on the Internet and insert them into screens in Educreations while telling a story about the picture. The picture can be "expanded" if children draw on the screen while talking about the picture. Other similar apps having UDL features include Doodlecast for Kids (zinc roe 2011); and Doodlecast Pro (zinc roe n. d.). Such apps are powerful because they create unique, permanent product records of children's language and allow them to demonstrate information and technology literacy using the UDL principle of multiple means of expression.

The final phase of the technology integration framework is implementation of the planned activity, or TEACH IT. On the surface, implementation appears to state the obvious, i.e., that a planned activity could be smoothly and effectively delivered to young children. However, when integrating technology, the potential exists for many barriers to successful delivery that may not have been anticipated. It is important that the early childhood education professional adhere to the plan that has been developed. This is referred to as *fidelity* (Blum and Parette 2013).

Typically, in many early childhood classroom settings, there are multiple education professionals involved in the EXPECT IT phase. All individuals involved in the TEACH IT process need to reflect with one another on how well the technology is being integrated, while also jointly deciding on whether the planned activity steps should be adhered to or changed. Even the most prepared early childhood educator may need to refine the plan. The library media specialist needs to consult with all early childhood education professionals and not assume that delivery of the planned activity is effective. Follow-up collaborative meetings are essential, as well as discussions of data collected during the CHECK IT process. Several people looking at work products and other data collected can help improve the technology integration and outcomes associated with the planned activity.

Considering UDL in Teaching Information and Technology Literacy

A key assumption of the EXPECT IT-PLAN IT-TEACH IT framework is that UDL principles are considered in the process of technology integration. As previously noted, application of UDL principles in this process creates (a) multiple means of representation to enhance access to curriculum; (b) multiple means of engagement to foster motivation; and (c) multiple means of action and expression enabling various approaches to physically do things needed to engage the curriculum, express oneself, or use technology to manage and self-regulate information. Because many of today's technologies appropriate for use in early childhood classrooms are dynamic, interactive, shared, and flexible (Parette et al. 2013b), they play a unique role in ensuring that UDL principles can be implemented.

Numerous Web 2.0 tools are designed to accomplish many of the goals inherent in information and technology literacy. Web 2.0 tools permit collaboration, social connection, sharing, cooperation, communication, and democracy. Common Web 2.0 tools such as *VoiceThread* (VoiceThread LLC 2013), *MindMeister* (MeisterLabs 2013), podcast tools, and other technologies have an array of applications with young children. Additionally, apps and e-books can be used in unique and creative ways to foster similar information and technology literacy skills. The flexibility of these tools, as well as the features within the hardware itself (e.g., text-to-speech and accessibility features within the operating systems) allow young children to access the curriculum in ways that were previously thought cumbersome or inefficient. The Center for Applied Special Technology (CAST) has a free UDL lesson plan builder at http://lessonbuilder.cast.org/. The CAST Web site also has a wealth of resources and examples that the library media specialist and the early childhood education professional can explore together. There are specific examples of lesson plans that adhere to UDL principles with links to teacher reflections on the planning process. The lesson plan builder offers tips on how to adhere to UDL principles.

McPherson (2009) documented how early childhood education professionals used blogging tools to create a connected, international collaborative effort on the

life cycle of butterflies. Utilizing similar tools, library media specialists can expand the frequently limited access early childhood educators have to libraries and librarians.

When considering UDL principles, planning is a key characteristic of effective development of a technology-supported classroom activity. While some technologies and curricula for young children have features of UDL principles, library media specialists must collaborate with other early childhood education professionals to ensure that these principles are used in developing planned activities which focus on information and technology literacy skill development. The EXPECT IT-PLAN IT-TEACH IT framework was designed to be a practical, activity-based approach to technology integration. It incorporates elements of traditional lesson planning while ensuring that technology is part of the everyday experience in the early childhood classroom. EXPECT IT-PLAN IT-TEACH IT considers the connections among between available technology, instructional strategies, and the curriculum in order to integrate technology effectively. While CAST points out that technology is not requisite to implement UDL principles (Rose et al. 2011), the nature of digital and Web-based tools is such that they are more flexible, interactive, and dynamic, thus making UDL much easier to achieve. Hence, the EXPECT IT-PLAN IT-TEACH IT framework is a natural fit for library media specialists and early childhood education professionals to embed UDL principles during PLAN IT. As noted in Fig. 10.1, all instruction begins with EXPECT IT. Consistent with UDL principles, these expectations are not modified, but access is enhanced using UDL principles. Each row in Table 10.1 presents a PLAN IT consideration accompanied by examples of how each UDL learning principle might be applied. Although a few exemplars are noted, it should be recognized that UDL is a complex framework about which entire books are available. It is important that library media specialists consult more extensive resources regarding the principles, especially the CAST website.

In Table 10.1 there is sometimes an overlap between instructional strategies and the curriculum. This is because instructional methods and curriculum are frequently harnessed together. When planning any form of instruction, educators start out considering technology, instructional strategies, and curriculum separately. However, once the planned activity is developed, technology, instructional strategies, and curriculum start to merge into a learning experience that is child-focused. Incorporating the UDL principles into the EXPECT IT-PLAN IT-TEACH IT technology integration model only enhances the child-centered, activity-based approach. One additional consideration in the EXPECT IT-PLAN IT-TEACH IT framework of technology integration is the tier of support, or response-to-intervention (RtI) tier (Blum and Parette 2013). In RtI, young children are screened for academic or behavioral needs and identified for early intervention that matches their needs. The more intense the need, the higher the tier. Most RtI models are considered three-tier models of support. The first tier responds to the core curriculum and typically-developing children. The second tier responds to children who are at-risk but need only modest intervention. The third tier targets children who require intensive intervention to address needs that could not be met using a tier 2 intervention. In the UDL framework, RtI is important because instructional strategies vary as the intensity of supports

Table 10.1 TECH IT's & ARRANGE IT's connection to UDL

PLAN IT	Multiple Means of Representation	Multiple Means of Action and Expression	Multiple Means of Engagement
TECH IT: *Technology*	Identify technology features that allow for flexible representations (e.g., visual support; text-to-speech; highlighting of text)	Identify technology that allows for flexible responses (e.g., respond with drawing or picture; respond with a voice recording; respond by selecting a picture on an app or using a Web 2.0 tool)	Identify technology features that support multiple means of engagement (e.g., apps that give mastery feedback, allow for choice, and are relevant and authentic to young children's learning)
ARRANGE IT: *Instructional strategies*	Embed different means of representation with the strategy (e.g., visual vs. auditory prompting or scaffolding)	Embed opportunities for different means of physical expression within the strategy (e.g., during interactive discussions allow for responses using assistive technology or drawing of responses). Consider strategies that foster executive functioning (e.g., teach and model problem solving)	Embed choice, authenticity, mastery feedback, community, reflection and other elements of engagement within the instructional strategy (e.g., in guided discovery, follow the child's interest, have interactive reflective discussions on why it is important to learn something, and embed learning opportunities during natural routines)
ARRANGE IT: *Curriculum*	Consider different options for representation connected to the curriculum (e.g., present the life cycle in a graphic organizer; allow children to touch real objects associated with vocabulary)	Consider different means of action and expression tied to the curriculum (e.g., use paper visual schedules to promote routine-related tasks; allow assistive technologies to support fine motor tasks connected to curriculum; allow expression of curricular goals through pictures, graphs)	Consider expanding choice, connecting to authentic and meaningful experiences, and reflection on learning within the curriculum (e.g., use real items and food to recruit interest in a lesson on food; expand the lesson by going to a store; reflect on why students need to learn about food, and rate self-knowledge)

provided to children change (Cates et al. 2011). In EXPECT IT-PLAN IT-TEACH IT, RtI is reflected in curricular changes and the corresponding instructional strategies that are connected to them. Intensifying instructional supports typically does not lead to curricular changes in early childhood classrooms; however, if a student is significantly behind his or her peers, UDL may enhance curricular access but will

most likely require pairing with specialized educational supports (Peterson-Karlan et al. 2013).

VoiceThread: A Readily Available Technology Having UDL Features

Today's early childhood education classrooms often have some available technology that education professionals can use to deliver their curricula. A computer with Internet access should be a key component of the technology infrastructure (Parette et al. 2013d; Simon and Nemeth 2012) to provide depth of the learning experiences afforded young learners when using the computer. To maximize the potential of both these tools, an LCD projector or interactive whiteboard (e.g., Promethean Board, SMART Board) have increasingly been integrated into many early learning settings (Simon and Nemeth 2012; Parette et al. 2013b) and play an important role in curriculum delivery. Of particular importance, LCD projectors and interactive whiteboards that are connected to computers having Internet access enable access to a broad array of other readily-available technologies that are free or low cost (Parette et al. 2010, 2011, 2013c).

One example of a free Web 2.0 technology having UDL features is *VoiceThread* (VoiceThread LLC 2007–2011). This tool has an array of uses in an early childhood classroom (Gillis et al. 2012). In the most general sense, *VoiceThread* might be described as a multimedia slide show tool that displays images, documents, and videos (Brunvand and Byrd 2011). Its potential lies in the ability of both the young child or education professional to create and upload content, explore slides, and construct comments using voice, text, audio file, video, or doodling (drawing). Gillis et al. (2012) have described features of *VoiceThread* and how it can be used with young children for emergent literacy activities.

In the case of Shatoya, whose learning characteristics were described previously, *VoiceThread'*s UDL features enable her teacher, Ms. Jones, to plan a classroom activity connected to an EXPECT IT learning standard (Demonstrate an emerging understanding of spoken words, syllables and sounds [phonemes]), and related learning objective (matches pictures to beginning sounds—"p," "c," "d," and "b"). Once that decision is made, she proceeds to PLAN IT. In collaboration with the library media specialist, Ms. Obadia, she selects a TECH IT tool—*VoiceThread*—for the planned activity because she knows that it has many features that allow her and the students in her classroom to represent content, i.e., both her instructional content and the students' subsequent work products and thinking/understanding about the beginning sounds 'p,' 'c,' 'd,' and 'b,' in a number of ways. The library media specialist and teacher discuss how much Shatoya likes computer-based activities, and the big screen format enabled by use of her LCD projector and wall-mounted screen will support her engagement. Since *VoiceThread* allows students to "act" and express themselves using text, audio, video, or drawing by doodling, Ms. Obadia points out to Ms. Jones that there is great flexibility in how the children will

communicate their knowledge and skills regarding the beginning sound instruction both to her and to one another during the planned activity. Shatoya has problems communicating orally, but she likes to draw. *VoiceThread's* features, enabling her to upload drawings and record either her voice or a video, or doodle while making comments about her drawings, will allow Shatoya, and all students, to have choices about comments they wish to make. Finally, Ms. Jones shares with Ms. Obadia that she can design the planned activity using *VoiceThread,* her computer webcam, and her LCD projection system in such a way that children will be engaged at multiple levels.

Having made the decision to use *VoiceThread* in the planned activity, Ms. Obadia and Ms. Jones then make an ARRANGE IT decision and choose the specific instructional strategies to be used when teaching "p," "c," "d," and "b." Ms. Jones suggests *direct instruction*, which will allow her to present each of the four letters and a picture representing each of the beginning sounds, in sequence, on four *VoiceThread* screens. She can present *models* of the sound and how it is produced, followed by having children repeat her modeling of the beginning sound. She can then return to each of the four letter screens and have the class respond to her question, "What is the beginning sound?" wherein she can listen to the choral responses provided and correct any inaccurate sound pronunciations by the students. Students will then be presented with a series of *VoiceThread* screens presenting only pictures (pen, cat, ball, and dog) and asked to name the sound with which each picture begins. This is both part of the direct instruction process in ARRANGE IT and a part of CHECK IT, or assessing children's performance on the learning objective for the planned activity. Additionally, Ms. Obadia and Ms. Jones decide, after the direct instructional component of the lesson, she will use a guided discovery strategy to ask students to draw a picture of something having each of the beginning sounds. She will ask students to choose between uploading their picture to VoiceThread and making an audio comment about it, or recording a video of themselves showing and talking about their picture. Providing students with these options supports multiple means of engagement and provides the teacher with the representation of content (i.e., the students' images and their explanations) in several formats. Additionally, when the children view the VoiceThread later (in a big screen format), they hear both audio *and* see images/video—multiple means of expression—that have been captured. Permanent products in varying forms are present to document the children's work, i.e., hard copy drawings, uploaded pictures of children's work, audio explanations of work provided by children, and/or video footage of children commenting on their work. Ms. Obadia tells Ms. Jones that, when the children come to the library, they will expand on this lesson by talking about letter sounds on VoiceThread related to stories read in e-books.

The previous example illustrates the immense potential of current and emerging technologies having UDL features that allow young children and education professionals to integrate technology using the EXPECT IT-PLAN IT-TEACH IT framework in a flexible manner that supports and enhances access to curriculum by all learners. Education professionals will only be limited by their creativity with regard to how these technologies can be used in tandem with UDL principles to support curricula in twenty-first-century classroom settings.

Conclusion

UDL is a frontier of education in the twenty-first century. This chapter outlines how early childhood media specialists can integrate technology into their instruction. Use of UDL with the technology integration framework sets the stage for instruction to be connected to outcomes for all young children. While the EXPECT IT-PLAN-IT-TEACH-IT technology integration framework was developed in the United States, its basic principles are broad enough that it can be employed internationally.

Likewise, UDL is designed to cut across cultural barriers. Cultures and nation-states may have unique worldviews that influence their instruction of young children. Even so, in working with UDL and the technology integration framework described in this paper, the media specialist needs to consider how their culture views the instruction of young children and the role of the media specialist. Saito-Kitansako (2012) conducted a case study using UDL in first and third grade in Japan. Teachers who adopted UDL principles effectively into their classroom found alignment between UDL principles and the Japanese learning philosophy of collectivism. Internationally, media specialists wishing to employ UDL and the EXPECT IT-PLAN-IT-TEACH-IT framework should work within their context and philosophy.

When employing UDL in nation-states, it is necessary to consider both global and local contexts. For example, it is now considered a human right for girls, as well as boys, to have access to education (UNESCO 2005). This global standard, as well as UNESCO's guidelines to inclusion were essential when considering the development of policy and practice of inclusion in counties like Brunei Darussalam (a small country in South East Asia on the Island of Borneo) (Fitzgerald 2010). Media specialists need to consider the global context, the local context, and striking a balance between current values and accessibility to education and technology to achieve outcomes for young children. Global values of accessibility may be counter to some parochial world views. Finding ways for stakeholders to draw meaning consistent with local cultural norms, as well as values of the global community that promote equity and accessibility, is essential. Opening up dialogues about technology and accessibility with teachers, parents, and community partners can facilitate this goal.

As important as UDL and the technology integration framework is to obtaining educational outcomes and accomplishing educational equity, it is noteworthy that young children need supervision when using technology to accomplish educational goals. Most devices are relatively safe, but young children must be kept away from electrical areas. Covers are available to make it difficult for young children to access outlets that are plugged into the wall. Sturdy, protective covers for devices such as iPads are also useful. Most importantly, the media specialist needs to introduce technology as a tool for learning and the expectations when using it. When media specialists model for young children how to use technology tools, they are quite capable of using them safely with proper supervision.

In addition, schools should supervise children while they are accessing the Internet and set up firewalls to prevent children from stumbling upon inappropriate material. While young children are vulnerable, they also can be made resilient and empowered when taught media literacy. Much like we teach young children healthy eating, we can also protect young children by teaching them about a healthy media diet. It is noteworthy that a media diet does not mean to be media free, but rather to be in a media-rich environment with interactions that are healthy and developmentally appropriate. In many cultures, the concept of "media free" is unrealistic because the culture has embraced technology; hence, activities such as media-free weeks do not encourage young children to become discriminating users of technology and media but encourage abstinence, a failed goal from the start. Children should not only be consumers of technology but creators in their use of technology. Ensuring young children use interactive technology as part of their imaginary play and artistry is an important part of safe and developmentally-appropriate practice. When media specialists provide young children with safe, developmentally-appropriate, universally-designed learning environments that integrate technology with intentionality (i.e., EXPECT IT-PLAN IT-TEACH IT), the environments that young children learn in will be enhanced and consistent with a twenty-first-century global community.

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