Children who have complex communication needs (CCN) require development of communicative competence because they are unable to meet their communication needs through natural speech. Attaining communicative competence requires proficiency in four main domains: linguistic, operational, strategic and social (Light, 1989). Programs to develop communicative competence in children with CCN using augmentative and alternative communication (AAC) have focused on instruction of target skills or strategies in linguistic (Lund & Light, 2003; Sigafoos, Didden & O'Reilly, 2003), strategic (Light, Binger, Agate & Ramsay, 1999), and social (Drasgow, Halle, & Sigafoos, 1999) competence. Although limited research on effective instruction in operational competence exists, the efficacy of various instructional methods or procedures in teaching the operation and use of AAC systems remains unknown.

Effective instruction on the operation and use of AAC systems to develop communicative competence is essential for several reasons. First, AAC systems can be daunting and thus to attain communicative competence, extensive instruction for the child who uses AAC and his/her communication partners is often needed (Beukelman, 1991). Attaining communicative competence is further affected by the limited number of sessions funded by some AAC service delivery providers (e.g., Medicare and HMOs). Thus, children who use AAC may not receive the training needed to achieve communicative competence before they are discharged from intervention. Lastly, considerable time is needed to support educational programs and activities for children in school. Effective instruction is needed to reduce the time required to train children to become proficient in using their AAC systems so that children who use AAC can focus on educational programs and activities. It is apparent that to reduce training time and to provide efficient instruction we need to identify effective methods of instruction that will help develop communicative competence in children who use AAC systems.

The corrective feedback (CF) method of instruction is frequently used in instruction of AAC use and operation and involves principles adapted from Deshler and Schumaker (1988). The main principles involve: introduction, instruction, practice, feedback and follow-up. Practice principles involve the use of a hierarchy of least-to-most prompting. Corrective feedback and cues are provided when an error is produced or when there is no response. Through the use of feedback and cues, clinicians attempt to reduce the number of errors children make when practicing a new strategy; however, this does not ensure errorless learning. The goal of instruction and practice is to use the least amount of prompting required to achieve accuracy and independence.

Clinical evidence indicates that errors are not uncommon in the CF method of instruction. Errors, however, compromise the speed and content of the communicative exchange. As stated previously, the goal in AAC intervention is to achieve communicative competence for the child who uses AAC and to do so, accuracy in message selection is required. Errors need to be reduced and other strategies that facilitate accuracy need to be incorporated into AAC intervention.

Errorless learning strategies have been employed in other fields to facilitate performance and retention of skills such as memory and discrimination (Baddeley & Wilson, 1994). To date, AAC interventions strategies have not employed a complete errorless learning strategy to teach children operational competence of AAC systems due to limitations in the AAC systems and/or unique characteristics of the child who uses AAC.

The development of a new high-technology AAC system may aid in increasing the knowledge of the effectiveness and efficiency of AAC systems instruction. A new dual screen AAC system has been developed that allows simultaneous access to current AAC systems by the child who uses AAC and the communication partner or facilitator. Currently, most AAC systems have one display monitor that a child activates. This new technology has a second display monitor with touch screen access that allows both the

child who uses AAC and his/her communication partner or facilitator to view and interact with the same display. Children who use AAC may be guided to the appropriate selection through the use of the mouse cursor on the second screen, thereby reducing or eliminating errors. This dual-screen guidance (DSG) method allows for current high technology AAC applications to be used. No research has been conducted on the use of the DSG method to assess learning of AAC systems in children.
Methods using the new dual-screen technology with current AAC applications may reduce the time and resources required in learning these systems; however, empirical evidence is first needed to evaluate current instructional methods compared to methods that incorporate the new dual-screen technology in teaching children to use AAC systems.

The purpose of this study was to compare the impact of two instructional methods (CF – Corrective Feedback; DSG – Dual Screen Guidance) on the ability of children to accurately and efficiently operate and use a dynamic display AAC system. The following research questions were answered by analyzing the data:

1) To what extent are children able to engage in errorless learning during guided practice in the DSG learning sessions?
2) What is the impact of age and instructional method on learning based on:
    a. Accuracy?
    b. Efficiency of use:
        i. Number of additional selections?
        ii. Time per accurate score?
3) To what extent are typically developing 6- and 7-year old children able to generalize their skills to unfamiliar sentences?
4) To what extent are typically developing 6- and 7-year old children able to maintain their skills after two weeks?

Methods

In the CF instruction method, feedback and prompts were provided to the child if no response or an error occurred. In DSG instruction, errorless learning strategies were employed. Children were guided to the appropriate selection on the shared display screen of a second monitor. Twenty-one children, 10 six-year olds and 11 seven-year olds, were randomly assigned to an instructional method.
Each child participated in five sessions: three learning and testing sessions (Session 1 – 3), one generalization session (Session 4), and one maintenance session (Session 5).
In the learning sessions (Sessions 1 – 3), the children were required to complete two sentence lists, the guided practice (GP) list and one of the testing sentence lists. The GP list consisted of six sentences and was used to provide the children with guided practice for each instruction method. The two testing sentence lists were counterbalanced in each instruction method. In the generalization session (Session 4), the list not used in the learning sessions was used to probe for generalization. In the maintenance session (Session 5), the same list as that used in the generalization session was presented.
In all learning sessions for the guided practice and testing, the target sentence was presented in written text above a picture stimuli. The children were asked to copy the target sentence using the AAC system, thereby producing the same sentences for each stimulus. Twelve pictures and sentences were presented in each learning session. The use of the pictures and sentences controlled for differences in topics and message formulation.
The sentences were between four to seven words, with each word ranging from one to three syllables in length. The three sentence lists had equivalent Flesh-Kincaid scores

that were at the 1st grade level. In addition to equivalent Flesh-Kincaid scores, the three lists were modified to equalize the semantic categories and operational commands used in the AAC system.

Results and Discussion

Results showed children given DSG instruction were able to engage in 100% errorless learning during guided practice. Results also showed statistically significant differences in accuracy and efficiency of 6- and 7-year olds. Seven year-olds were more accurate and took less time to complete the task than 6-year olds. Instruction method did not have a statistically differential effect on learning in 7-year olds. For 6-year olds, however, those given DSG instruction exhibited different learning curves than those given CF instruction. All children were able to generalize and maintain their learning.

Results from the current and previous learning studies (Drager, Light, Carlson, D'Silva, Larsson, Pitkin & Stopper, 2004; Light, Drager, McCarthy, Mellott, Millar, Parrish, et al., 2004) indicate that children younger than 7-years old require more instruction time to learn to proficiently use dynamic display AAC systems. Because DSG instruction employs errorless learning, the cognitive demands of learning to use a dynamic display AAC system are reduced.

Consequently, the time required to achieve proficiency in using a dynamic display AAC system is reduced. Thus, using DSG instruction for children younger than 7-years may reduce the instruction time required to learn to use a dynamic display AAC system proficiently, allowing more time to be allocated to facilitating development of language, literacy, and social skills. Future research is needed to examine the impact of errorless learning on the use of a dynamic display AAC system with children younger than 6-years and individuals with disabilities.

REFERENCES

Baddeley, A., & Wilson, B. (1994). When implicit learning fails: Amnesia and the problem of error elimination. *Neuropsychologia, 32,* 53 – 68.

Beukleman, D.R. (1991). Magic and cost of communicative competence. *Augmentative and Alternative Communication, 7*, 2 – 10.

Deshler, D., & Schumaker, J. (1988). An instructional model for teaching students how to learn. In J.L. Graden, J.E. Zins, & M.J. Curtis (Eds.), *Alternative educational delivery systems: Enhancing instructional options for all students* (pp. 391 – 411). Washington, DC: National Association for School Psychologists.

Drager, K., Light, J., Curran Speltz, J., Fallon, K., & Jeffries, L. (2003). The performance of typically developing 2 ½-year olds on dynamic display AAC technologies with different system layouts and language organizations. *Journal of Speech Language and Hearing Research, 46,* 298 – 312.

Drasgow, E., Halle, J. W., & Sigafoos, J. (1999). Teaching communication to learners with severe disabilities: Motivation, response competition, and generalization. *Australian Journal of Special Education, 23*, 47 – 63.

Light, J. (1989). Toward a definition of communicative competence for individuals using augmentative and alternative communication systems. *Augmentative and Alternative Communication Journal, 5*, 137 – 144.

Light, J., Binger, C., Agate, T., & Ramsay, K. (1999). Teaching partner focused questions to individuals who use augmentative and alternative communication to enhance their communicative competence. *Journal of Speech, Language, and Hearing Research, 42,* 241 – 255.

Light, J., Drager, K., McCarthy, J., Mellott, S., Millar, D., Parrish, C., et al., (2004). Performance of typically developing four- and five-year-old children with AAC

systems using different language organization techniques. *Augmentative and Alternative Communication, 20*, 63 – 88.

Lund, S., & Light, J. (2003). The effectiveness of grammar instruction for individuals who use augmentative and alternative communication systems: A preliminary study. *Journal of Speech, Language, and Hearing Research, 46,* 1110 – 1123.

Sigafoos, J., Didden, R., & O'Reilly, M. (2003). Effects of speech output on maintenance of requesting and frequency of vocalizations in three children with developmental disabilities. *Augmentative and Alternative Communication, 19,* 37 – 47.