Occupational Therapy's Role in School-Based Deaf Education Programs: A Focus on Fine Motor Development of American Sign Language Handshapes

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Background

The special education category of Hearing Impairment/Deafness is considered a low-incidence diagnosis. According to Gallaudet Research Institution's most recent Annual Survey of Deaf and Hard of Hearing (d/DHH) Children and Youth (2013), approximately 40% of d/DHH students nationwide receive special education services for one or more disabilities. A study by Peterson et al. (2023) found that approximately 65% of d/DHH students had one or more conditions that qualified them for special education services outside the categories of hearing impairment and deafness. Students with multiple disabilities may receive related services for physical impairments related to fine and gross motor development. Established standards exist related to developmental fine motor skills. Fine and visual motor assessments used in school-based practice include the Beery-Buktenica Developmental Test of Visual-Motor Integration-Sixth Edition (Beery & Beery, (2010) Peabody Developmental Motor Scales-3 (Folio & Fewell, 2023) , Bruininks-Oseretsky Test of Motor Proficiency, Second Edition (Bruininks & Bruininks, 2005), and Developmental Assessment of Young Children, Second Edition (Voress & Maddox, 2013). Additionally, various assessments exist for evaluating the development of American Sign Language (ASL) Skills. They include the SKI-HI Language Development Scale (LDS), Third

Edition (Tonelson, 2020), MacArthur-Bates Communicative Development Inventories (MB-CDIs), Third Edition (Marchman, Dale, & Fenson, 2023), Visual Communication and Sign Language Checklist (VCSL), First Edition (Simms, Baker, & Clark, 2013), and Kendall Conversational Proficiency Levels (P-Levels) (French, 1999). However, there are no normed standards or assessments specifically related to fine motor skill development in ASL.

Sanzo, Greer, & O'Connell (2022) created a document for practitioners to determine the impact of motor skills on sign articulation. It's called the Language First Motor Skill Chart and Resource 2nd Edition: Impact of Motor Skills on Sign Articulation (Language First, n.d.). Of note, ASL production errors can be linguistic-based (phonological) or motor-based (articulatory). This resource assesses motor-based ASL articulation errors and identifies implicated articulators (i.e., hands, arms, wrist, fingers, torso, and face/head) and which component of articulation is affected (i.e., Handshape Formation, Place of Articulation, and Path of Movement). Additionally, Greer and Ofori-Sanzo (2024) created the American Sign Language Articulation Test (ASL-AT), which is an informal assessment of how a d/DHH child articulates words in ASL. Students are presented with stimulus cards and target words. The stimuli target specific movements of the shoulder, elbow, forearm, wrist, and digits. This assessment is intended to identify articulation errors only. It is not intended to identify phonological or linguistic errors. These informal assessments are useful in determining specific fine motor development needs of students in Deaf Education programs. However, there is no evidence-based intervention program directly supporting the fine motor development of American Sign Language handshapes. As part of a doctoral capstone project, an occupational therapist within a large Metropolitan School District and an occupational therapy doctoral student collaborated to address the fine motor development needs of students who use ASL.

Capstone Program Development

Various elementary Deaf Education teachers reported implementing daily fine motor centers to the OT capstone student during semi-structured interviews (A. Gagliardi, personal communication, February 7, 2025; H. Cole, personal communication, January 31, 2025). Center activities included tracing/drawing on an easel, name writing, word scavenger hunts, popsicle stick letter formation, letter/number puzzles, dot marker art, and building letters/shapes using magnetic building tiles. Related directly to ASL handshape development, teachers reported using the strategies outlined below.

- ASL Man is a program that a Teacher of the Deaf (TOD) adopted after attending a professional development course hosted by Todd Czubek, the co-author of a Bilingual Grammar Curriculum that focuses on ASL/bilingual programs. In ASL Man, the TOD introduces weekly signs that coordinate with the lessons. The TOD and ASL interpreter show the students the sign, has the students sign it, and then has the students identify where on the ASL man that sign belongs. ASL Man supports handshapes of students because it specifically works on the location and articulation of handshapes (A. Gagliardi, personal communication, February 7, 2025). A photo of ASL Man program is included in Appendix A.
- The handshape game is a weekly activity that specifically focuses on the handshape itself. In the game, the TOD will give students a handshape, like handshape 5, for example, and

students must go around in a circle giving different signs that use that handshape (i.e., “mom”, “fine”, “moose”) (A. Gagliardi, personal communication, February 7, 2025).

- The letter of the week is implemented in the preschool Deaf Education classroom. Every Monday, the teacher and ASL interpreter will pick a letter of the week and go over how to sign that letter, visual phonics, and different words that start with that letter. Throughout the week, they will complete different activities that have to do with that letter, such as tracing and writing that letter (H. Cole, personal communication, January 31, 2025).

Some students on the OT caseload cannot replicate the fine motor handshapes even with daily repetition. There was a need for additional direct support to strengthen isolated hand movements to demonstrate the handshapes. After learning about the current practices and needs, the capstone student created resources to address these needs. The resources included a Fine Motor Skills Development Infographic, Handshape Program Manual, and a play-based assessment of ASL handshapes.

- ASL Fine Motor Skills Development Infographic: An evidence-based infographic was made for important team members (TOD, ASL interpreters, paraprofessionals, etc.) that explains handshape development (Appendix B). To be able to address handshape development when teaching ASL, teams need to understand the developmental sequence of the hand muscles. The created infographic was based on an existing resource about fine motor development in ASL. Braem (1990) suggested that the anatomical interdependence of fingers influences handshape acquisition in sign language. Braem (1990) reported that the index finger is the first to show independent movement, followed by the thumb, then the pinky, then the middle and ring fingers. More information about

this topic can be found in the infographic attached. Knowledge of these stages helps OTPs support ASL handshape development.

- Handshape Strengthening Program Manual: The capstone student created a program manual focused on developmental fine motor interventions for students learning ASL who present with fine motor delays (Appendix C). This program was designed to be play-based and given to educators and families as hand shape strengthening ideas. A program manual was chosen because families and educators would be able to easily access and use it. While creating the program manual, it was important to keep in mind to keep the interventions easily accessible to implement in the classroom or at home with accessible materials.
- Play-Based Assessment: Due to limited research within this population, the OTP at this school obtained IRB approval to research fine motor assessments and interventions. Part of the research project was to create a play-based assessment to evaluate students' handshapes. Therefore, the capstone student created an ABC animal informal assessment checklist (Appendix D) to use for the research project. This informal checklist included all handshape letters of the alphabet and an animal that goes with each letter. For example, the handshape letter “A” is for a gorilla. When assessing students using this checklist, we will tell them, “Use your fists like this to bang on your chest as a gorilla does!” This assessment does not use ASL signs specifically; it primarily uses handshapes as ASL classifiers. In addition, this assessment requires an ASL interpreter to administer it.

After developing the Handshape Program Manual, the fine motor interventions were delivered individually and in a group setting. The individual sessions were 5–10-minute fine

motor warm-ups at the beginning of OT sessions for students who had identified fine motor needs and were enrolled in a Deaf Education program. Some examples of the interventions included:

- Manipulating Play-Doh in different ways to inhibit certain finger muscles to create multiple handshape letters.
- Finger football with a prompt inside the paper football that the student completes using Play-Doh (i.e., make a pancake out of Play-Doh). During the finger football intervention, there was a strong emphasis on using the middle finger and thumb to flick the paper football, as the middle finger is one of the last fingers to develop.

Finger hopscotch using the students' vocabulary words. The student was instructed to “hop” with her pointer finger and then middle finger, etc.

The group sessions were provided to all preschool students enrolled in a Deaf Education classroom. An example of a session starter included a “Let's move our fingers!” warm-up. This warm-up was an animal theme, so students had to use their fingers to quack like a duck, walk like a caterpillar, swim like a fish, etc. Other successful group interventions are listed below:

- Make a shape out of Wikki Sticks, trace the shape, and identify that shape in the classroom.
- A themed Valentine’s Day intervention where students rolled a large dice with different pictures/words on each side. After rolling the dice, they had to sign the words to their classmates.
- Build a classroom sea-life terrarium. Each student scooped kinetic sand and smashed it into the bottom of the tank. After that, each student had to find a sea-life animal that the capstone student hid around the room using tweezer animal catchers. Once found, they

had to bring it back to the table, sign what animal it was, and then use tweezers to place it in the sand.

Many interventions from the program manual incorporated multiple handshapes within a single activity. For the sea-life terrarium, the handshape “B” or “5” is produced when smashing sand into the bottom of the tank and the handshape “O”, “L”, or ‘F” is produced when using tweezers to place the animals in the sand. Each of these interventions allowed students to strengthen the muscles in their hands through play-based interventions that are easy to engage across educational developmental levels.

OT Call to Action

OTPs have the knowledge and training to address fine motor skills. Additional research and assessments are needed to address the specific handshapes utilized to articulate in ASL. In addition, OTPs need additional training and education in Deaf Culture and with ASL. Additional training and education can happen by implementing lectures within OTD programs or CEUs for OTPs working with this population. It is also important to work as an interdisciplinary team to ensure that students are getting appropriate services to enhance their success in the school setting. Overall, the program development with this capstone project was implemented in alignment with the Occupational Therapy Practice Framework, 4th Edition (OTPF-4), by addressing key domains, such as occupations and performance skills. Given the limited research and lack of standardized assessments for fine motor development in ASL, this project also emphasizes the need for OTPs to engage in occupational justice by advocating for equitable access to evidence-based evaluations and interventions that support communication and academic success for d/DHH students.

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Appendix A

ASL Man Program

The image shown below highlights the ASL Man program. After shown an ASL sign, the student identifies where on the ASL man that sign belongs. This program specifically works on the location and articulation of handshapes.

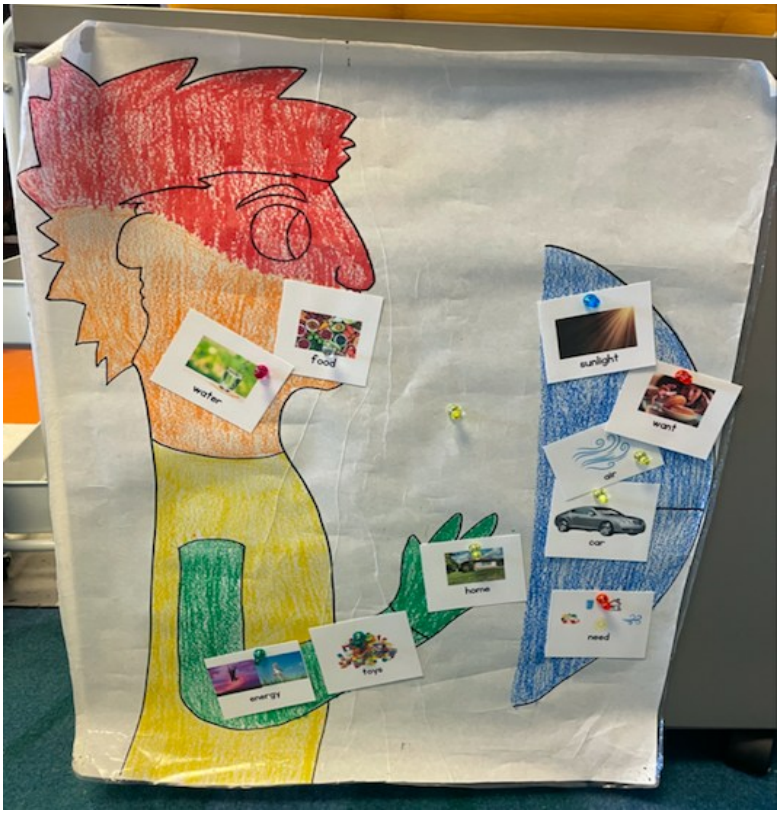

Photo Citation: Hufford, L. (2025). ASL Man

Photo Description: This image shows a white posterboard with a drawing of a man with vocabulary words placed on various parts of his body including his arms, mouth, and signing

space or area in front of his face and chest. The drawing of the man includes different colors to represent the location of handshapes (i.e. arm is green, chin, mouth and neck are orange).

Appendix B

Handshape Development Infographic

The following evidence-based infographic was created by the OT student for Deaf Education team members (TOD, ASL interpreters, paraprofessionals, etc.) to explain handshape development.

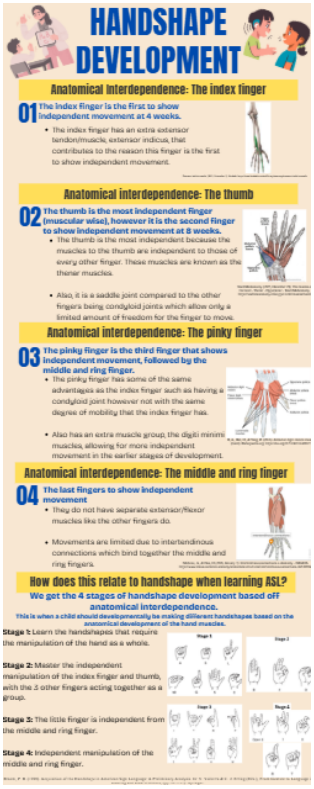

Image Description: This photo lists the 4 stages of the hand shape development sequence as (1) Anatomical interdependence: The index finger, (2) Anatomical Interdependence: The Thumb, (3) Anatomical Interdependence: The pinky finger, and (4) Anatomical Interdependence: The middle and ring finger. An anatomical photo of the associated muscles is provided with each

stage. Stage 1 includes a picture of the extensor indicus, stage 2 includes a picture of the thenar muscles, stage 3 includes a picture of the digiti minimi muscles, and stage 4 includes a picture of the intertendinous connections on the posterior side of the hand.

Appendix C

Handshape Strengthening Program Manual Examples

The following images highlight fine motor interventions included in the Handshape Strengthening Program Manual created by the capstone student.

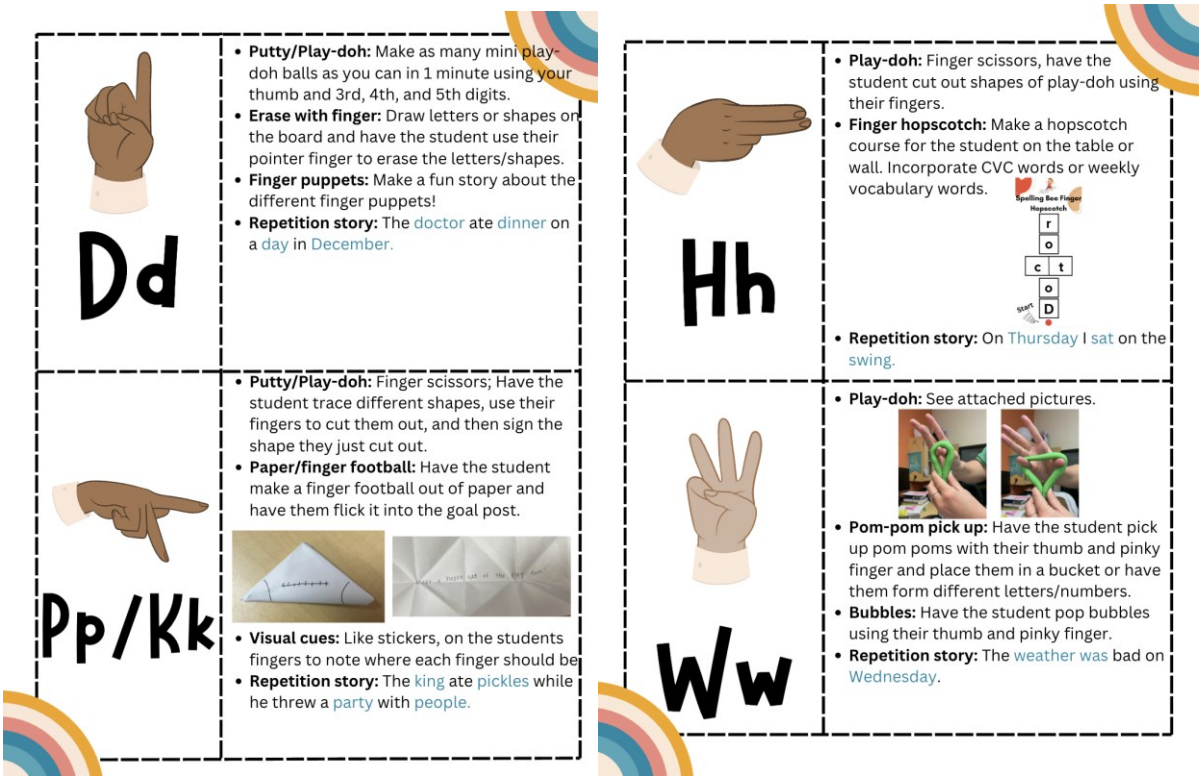

Image Description: This image provides examples of 3-4 fine motor exercises for the ASL handshapes Dd, Pp/Kk, Hh and Ww. The 4 ASL handshapes include the letter of the alphabet, a picture of the ASL handshape forming that letter, and the fine motor exercises as bullet points.

Appendix D

Informal Animal ABC Play-Based Assessment Example

The following images highlight aspects of the Informal Animal ABC Play-Based Assessment created to evaluate students' handshapes.

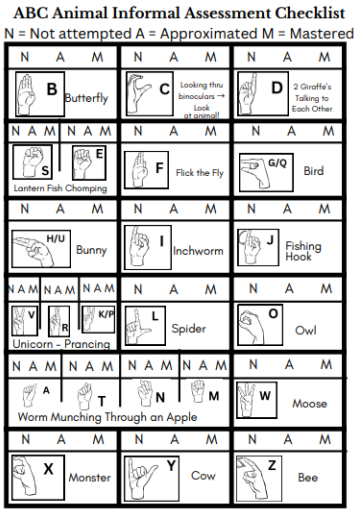

Image Description: The images show the informal assessment checklist for recording observations and 3 examples from the assessment. The examples include F: Flick the Fly - an

image of a person's hand ‘flicking’ a fly on a table. M/N/T: Caterpillar, a cartoon apple with a smiling caterpillar who ate through the apple, and X: Monster - an image of a red monster with horns.