

# Helping Hands: The Effect of 3D-Printing on ASL Literature Instruction

Cameron Davison and Dr. Kallianne L. Neumann  
Oklahoma State University

## Abstract

Helping Hands is a convergent mixed methods case study that examines how the use of an American Sign Language (ASL) handshape manipulatives affect the ASL poetry created by ASL students at Oklahoma State University. Participants engaged in two instructional settings. Each setting used the traditional methods of teaching ASL poetry; however, the settings differed when participants developed their original ASL poem. The "with handshapes" setting allowed students to use 3D-printed handshape manipulatives as a visual aid, and the "without handshapes" setting did not. Descriptive statistics revealed that participants had overall higher rubric scores in the "with handshapes" setting.

## Introduction

ASL is a living language that has its own grammatical structure, idioms, culture, and literature (Zinza et al., 2006). When learning ASL, some students struggle envisioning what their hands look like from a third-person point of view. To solve this problem, I designed and 3D-printed handshapes so students learning ASL literature have a physical object to manipulate and see from a third-person point of view. This change of perspective could improve the problems students face when learning literature in ASL. The research questions guiding my study are:

- (1) To what extent does using a 3D-printed handshape impact the quality of ASL poetry created by ASL students?
- (2) What is the difference in the process of creating ASL poetry with and without 3D-printed handshapes?
- (3) To what extent do the ASL poetry rubric scores confirm participants' experiences creating ASL poetry with and without 3D printed handshapes?

## Methodology

### Participants

Four students were recruited from Oklahoma State University's American Sign Language program.

### Instructional Method

To assess the development of participants' understanding of ASL literature, participants engaged in two different sessions: "without handshapes" and "with handshapes." The "without handshapes" setting consisted of the traditional methods of teaching ASL poetry, which covers the history of ASL literature, the rules of poetry, videos of native Deaf signers' poems, and the participant creating an original poem. The "with handshapes" setting began with the traditional methods of teaching ASL poetry; however, participants were allowed to use the 3D-printed handshapes when they created their original poem.

### Data Collection

Quantitative data consisted of ASL poetry rubric scores. The rubric assessed six criteria: Creativity, Classifier Usage and Understanding, Fluency, Facial Expression, and Role Shifting, Eye Gaze, and Use of Space. Each rubric criterion was worth three points; the highest possible rubric score was 18 points. Qualitative data consisted of written responses from two surveys (session 1: demographics, session 2: reflection on experiences) and observation notes of participants while they were creating their original poems.

### Data Analysis

Descriptive statistics were calculated on rubric scores. Written survey responses and observation notes each underwent thematic analysis using Braun and Clarke's (2006) six phase process to take notes on the data, code, find repeating patterns, categorize codes, name and define themes, and formalize themes.

## Results

**Quantitative.** Overall, students scored 2.25 points better with the handshapes ( $M = 16.25$ ) than without ( $M = 14$ ). The group did better in five of the six rubric criteria (all but Facial Expression). The with handshapes instructional setting had the biggest effect on Creativity (3 participants) but also may have contributed to Storyline (2 participants) and Classifier Usage and Understanding (2 participants).

**Qualitative.** Three themes emerged from survey responses, and four themes emerged from observation notes. Survey themes revealed all (4) students preferred using the handshapes, most (3) expressed more confidence when writing their poem with the handshapes, and half (2) expressed a lack of creativity when writing their poem without the handshapes. Observation themes revealed that all (4) participants submitted longer poems with handshapes ( $M = 72.25$  seconds) than without ( $M = 44.5$  seconds). All (4) students practiced their story more with handshapes. Most (3) expressed a lack of confidence about their poem without the handshapes, and most (3) used visual aids - either their hands or the 3D-printed handshapes - in both instructional settings.

Mean Rubric Scores for Each Poem by Criteria

| Criterion                                 | With Handshapes | Without Handshapes |
|---|-----------------|--------------------|
| Storyline                                 | 2.5             | 2                  |
| Creativity                                | 3               | 2                  |
| Classifier Usage and Understanding        | 2.5             | 2                  |
| Fluency                                   | 2.75            | 2.5                |
| Facial Expression                         | 2.75            | 3                  |
| Role Shifting, Eye Gaze, and Use of Space | 2.75            | 2.5                |
| <b>Total</b>                              | <b>16.25</b>    | <b>14</b>          |



Survey Themes

| Theme (#) <sup>1</sup>           | Definition  | Quotations   |
|----------------------------------|---|--|
| Preferred using handshapes (4)   | Participants described that they preferred using the handshapes to create their poems because they could envision what their hands could look like in their poem. | "I liked having the handshapes to have more of a visual picture that was constant in front of me."                                 |
| Expressed lack of creativity (2) | Participants described feeling less creative in the "without handshapes" setting.   | "I definitely thought it was harder coming up with unique concepts and handshapes [when I created a poem without the handshapes]." |
| Expressed more confidence (3)    | Participants expressed having more confidence when writing their poem in the "with handshapes" instructional setting.   | "The [handshape] method... made me feel more prepared to sign my story and feel confident that I understood the handshapes."       |

Observation Notes Themes

| Theme (#) <sup>1</sup>                | Definition  | Evidence/Quotations  |
|---------------------------------------|---|--|
| Increased length of recorded poem (4) | The length of participants' recorded poems was longer in the "with handshapes" instructional setting.                     | <b>With handshapes:</b> $M = 72.25$ seconds<br><b>Without handshapes:</b> $M = 44.5$ seconds   |
| Practiced story (4)                   | Participants practiced their stories more before recording when they were in the "with handshapes" instructional setting. | "She practices again, looking between her notes and the handshape."  |
| Expressed lack of confidence (3)      | Participants expressed a lack of confidence when writing their poem in the "without handshapes" instructional setting.    | "It's really choppy. I feel like it's not clear, so I am going to keep thinking. Let me tell you, stories are not my skill."   |
| Used visual aids (3)                  | Participants used a visual aid to aid the creation of their poem in both instructional settings.                          | <b>With handshapes:</b> <i>Used own hands</i> = 4 times;<br><i>Used handshape manipulative</i> = 24 times<br><b>Without handshapes:</b> <i>Used own hand</i> = 3 times |

<sup>1</sup> The number of students representing the theme are in parentheses after the theme name.

## Conclusion

The results of this research suggest that students may have more confidence and create more creative ASL poems when using handshape manipulatives as a visual aid. The rubric scores confirm that creativity improved for most (3) students. In the "without handshapes" setting, most (3) of the poems were linear - much like English grammatical structure, whereas the poetry from the "with handshapes" setting resulted in poetry that had more spatial organization and ASL concepts throughout the story. That said, one only student showed improvements in fluency scores in the with handshapes setting; the other three students' scores remained the same.

## Implications

Future research should repeat the study with more participants and varying experiences with ASL. Additionally, future research should evaluate the linear and visual fluency of participants instead of grouping them together in a single criterion.



## Acknowledgements

I would like to express my gratitude to my mentor, Dr. Kallianne L. Neumann, for encouraging me to conduct this research, guiding me through the research process, and being so willing to learn about a community and language that has shaped my life.

I would also like to thank the Deaf community for sharing their language and culture with me.

## References

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