Article

The effectiveness of voice-on and voice-off instruction on ASL vocabulary acquisition

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Abstract
Whether to use spoken English for the instruction of American Sign Language (ASL) is a pedagogical debate for those teaching hearing second language learners. Previous investigations have found the use of learners' first language to be beneficial for vocabulary acquisition. Studies on sign languages, however, have found that a class taught completely using signs is more beneficial than a class that incorporates spoken English, although the cognitive theory of multimedia learning argues that receiving input in various modalities fosters learning. In the present study, the efficacy of voice-on or voice-off instruction for acquisition of ASL vocabulary is examined. Twenty-six hearing adult students in an ASL class received either voice-on (spoken English) or voice-off (ASL only) instruction for 13 vocabulary items. They completed a comprehension test in the pretest, immediate posttest, and delayed posttest, as well as a production test in the immediate and delayed posttest. The results showed significant improvements over time for both conditions for comprehension and production; however, no differences between the two conditions were observed.

I Introduction

The inclusion of spoken English in the American Sign Language (ASL) classroom has been debated since the emergence of ASL as a foreign language. 'No-voice' policies

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are often implemented in ASL classrooms, removing spoken language from the context altogether. This approach limits the use of student first language (L1) or 'voicing' (namely, spoken English) and relies on the use of signs, gestures, or images for instruction on grammar, vocabulary, and culture. While most ASL classrooms opt for a 'no-voice' policy and employ the strict use of the second language (L2), empirical inquiry into this pedagogical approach is limited. The use of spoken English in the ASL classroom is a cultural consideration as much as it is a linguistic one. Many ASL instructors implement a voice-off policy to create a microcosmic deaf community in the classroom, where signed language is the culturally appropriate medium for communication. In contexts and interactions with the deaf community, a signer's use of spoken English can be considered rude, inconsiderate, or oppressive. Additionally, spoken English as a tool for language learning is a communicative modality that is not available to all ASL instructors, as many instructors of ASL are deaf. This controversy mirrors the discourse on the use of the native or target language, though considerably less is known about the utility of instructional differences in language modality (voice-on or voice-off).

As is the case for typical foreign language learning, learning vocabulary is one of the key factors for being a successful ASL user. Researchers in the field of second language acquisition (SLA) have inquired into the efficacy of using learners' L1 for L2 vocabulary acquisition and found that, overall, using learners' L1 facilitates L2 vocabulary (Lee & Macaro, 2013; Tian & Macaro, 2012). However, in an ASL context, a few recent studies have shown that voice-off instruction, the instruction given without spoken English, has resulted in better learning of signs than voice-on instruction (Rosen, DeLouise, Boyle, & Daley, 2014). These inconclusive findings are reported in a limited number of studies and call for further empirical studies.

II Review of literature

The goal of this study is to examine the effectiveness of voice-on and voice-off instructions on vocabulary learning in an ASL classroom. To provide background, first, we review the studies about the instructional language choice in a foreign language classroom, particularly those that have investigated the efficacy of instructional language on vocabulary acquisition. Then, we present the studies on the efficacy of voice-on and voice-off instructions on the acquisition of ASL vocabulary. Finally, we introduce a theoretical account that describes how multimodal instruction may be more beneficial than a unimodal instruction in terms of learning and its retention.

1 Instructional language and foreign language vocabulary learning

One of the ongoing debates in a spoken and written foreign language classroom is whether a language instructor should incorporate learners' L1 when teaching. Researchers who have opposed the use of the L1 argue that students need more L2 input (e.g. Kang, 2012; Mitchell, 1988); however, some have emphasized how incorporating learners' L1 may facilitate overall L2 learning (e.g. Cook, 2001; de la Campa & Nassaji, 2009; Schmitt, 2008; Storch & Wigglesworth, 2003; Swain & Lapkin, 2000; Tian & Macaro, 2012).

A number of researchers have examined the functions of learners' L1 in foreign language classrooms and found that using L1 discourages undesired student behavior (Duff & Polio, 1990; Macaro, 2001), facilitates L2 comprehension (e.g. Cook, 2001; van Lier, 1995), clarifies task instructions (Anton & DiCamilla, 1998; de la Campa & Nassaji, 2009; Ellwood, 2008; Macaro, 2001; Swain & Lapkin, 2000), promotes student-teacher relationships (e.g. Brooks-Lewis, 2009), encourages task completion (e.g. Swain & Lapkin, 2000), and reduces learner anxiety (see Hall & Cook, 2012 for a review) and cognitive overload (Bruen & Kelly, 2014; Scott & de la Fuente, 2008).

Recently, the efficacy of language choice has been extended to L2 vocabulary acquisition. Specifically, researchers have taken further steps to understand whether incorporating learners' L1 affects L2 learning (e.g. Lee & Macaro, 2013; Tian & Macaro, 2012). Some descriptive studies have shown that in a spoken foreign language classroom, the instructor often incorporates learners' L1 when describing vocabulary items (e.g. Nakatsukasa & Loewen, 2015; Polio & Duff, 1994; Tang, 2002). For example, Nakatsukasa and Loewen (2015) examined teachers' use of learners' L1 in focus-on-form episodes (FFEs) in a Spanish as a foreign language classroom. In their 12-hour-long class recording, they found a significant relationship between the teacher's language choice and the FFE's linguistic areas. They identified that when the FFEs concerned vocabulary, the instructor used learners' L1 60% of the time. This similarly high ratio of L1 use when describing the vocabulary items was also obtained by Polio and Duff (1994) and Tang (2002).

A few recent studies have illustrated that the incorporation of learners' L1 facilitates L2 vocabulary learning. In an investigation of the effectiveness of the L1 or L2 for vocabulary teaching, Tian and Macaro (2012) deliberately taught vocabulary and assessed learners' comprehension. Participants in this study were first-year students studying English at a Chinese university. They were assigned to either the control, code-switching, or non-code-switching condition and learned a total of 170 target vocabulary items. For the code-switching condition, the instructor provided focus-on-form (explicit explanations of lexical features) instruction and switched between English and Chinese, utilizing Chinese when referencing the target item. Students in the non-code-switching condition received the same instruction but in English. The control group received no instructions on or explanations of vocabulary. Vocabulary was taught over a period of 6 weeks and incorporated 17 listening passages. Students were given vocabulary comprehension tests before the administration of the intervention, during the intervention, and two weeks after the final instructional session. The results showed that teacher's code-switching was beneficial for vocabulary acquisition over using only English, and no variances across proficiency levels were reported. Similar findings were also reported by Lee and Macaro (2013) and Zhao and Macaro (2016) for adult learners. Although the number of studies is limited at this point, the available research collectively illustrates that the incorporation of L1 in vocabulary explanation works better than when the instruction is given only in learners' L2.

2 Instructional language and ASL vocabulary learning

Applying such findings in an ASL context is not as simple as it may sound. First of all, the use of spoken English is often discouraged in sign language classrooms. Additionally,

for pedagogical purposes, the instructor often incorporates 'glossing,' a technique that shows a sequence of English vocabulary to facilitate understanding of target ASL vocabulary. The researchers in the field of ASL education have examined the impact of using alternative modalities (e.g. voice-on vs. voice-off) for ASL learning, and the results are inconclusive (Rosen et al., 2014).

Rosen et al. (2014) found that voice-off instruction was more beneficial than voice-on for learning ASL vocabulary for hearing learners. In the first part of the study, the researchers investigated the effectiveness of voice-off, voice-on, or mixed method instruction (a balance of spoken and written English with ASL) on 44 vocabulary items related to family members. The instructor introduced the vocabulary, highlighted iconicity when present, and reviewed the production parameters. The participants in this study were 75 hearing and beginning level learners of ASL at a public middle school in New York. The students in the voice-off condition were taught vocabulary through the use of pictures, gestures, and visual explanations, with no utilization of voice by the instructor or students. For the voice-on group, the instructor utilized spoken and written English, and questions from students were asked verbally. The mixed method group was taught ASL vocabulary through spoken and written English, pictures, or gestures, and clarifications of vocabulary were provided in either spoken English or ASL. Based on the students' production test scores, the participants from the voice-off group performed best, followed by the mixed methods group, with the voice-on group achieving the lowest scores.

Following up this study, the same researchers conducted a similar experiment without a mixed methods condition with a total of 25 high school students. Students in the voice-on condition were taught target words related to jobs and careers in spoken English, while students in the voice-off condition were taught strictly in ASL. The researchers measured participants' comprehension of 20 target vocabulary. All the participants completed a pretest and a posttest in which they were asked to guess the meaning of each sign, as many of the items had an iconic basis. The voice-on group received instruction in spoken English, while students in the voice-off condition were taught exclusively in ASL and without the use of voice. The findings from the study show higher vocabulary comprehension for participants in the voice-off condition over those in the voice-on group. Collectively, the two studies seem to favor the use of voice-off methods over voice-on methods in vocabulary instruction; however, the results may not be generalizable yet because the number of studies is extremely limited. In addition, one of the studies compared the voice-on instruction against the voice-off instruction while incorporating multiple modalities (e.g. drawing, gestures, and visual explanations). More empirical studies that control the types of learners' input is indeed necessary to understand the effectiveness of voice-on and voice-off instruction.

3 Theoretical accounts

Mayer's cognitive theory of multimedia learning (CTML) accounts for differences in learning between auditory and visual channels and extends the belief that learning is deeper with use of visuals and words than from words alone (Mayer, 2009, p. 47). CTML

asserts three major assumptions: (1) there are two separate channels for processing information (auditory and visual); each channel (auditory or visual) has a limited capacity; (2) the process of learning involves filtering, organizing, selecting, and integrating information; (3) the brain does not exclusively filter multimedia featuring words, pictures, and auditory information into separate constructs. The brain organizes this information logically and creates concepts. Mayer also offers the modality principle of multimedia learning, which states that presenting words as speech within media, rather than just text, will produce better learning (Clark & Mayer, 2011). CTML is supported by several empirical studies which reported the facilitative roles of using images in vocabulary teaching (e.g. Akbulut, 2007; Chun & Plass, 1996; Jones & Plass, 2002). Akbulut (2007), for example, investigated the effectiveness of glossing provided in three formats: (1) definitions of words, (2) definitions and corresponding pictures, and (3) definitions with corresponding short videos. Sixty-nine college students in Turkey participated in this study. They were provided with an annotated text with glosses in one of the three formats and completed a pre-test, immediate- and delayed-post-tests that measured their vocabulary learning. The results showed that the learners in the picture and video conditions significantly outperformed the learners of definition condition.

In the context of sign languages, this theory indicates that seeing the target vocabulary presented in signs (visual) and listening to oral explanation via voice-on instruction (auditory) should reduce cognitive load between learners' auditory and visual channels. Then, it is logical to hypothesize that learners who receive vocabulary instruction with use of spoken words and visual depiction of the language (through the use of ASL signs), as in the voice-on condition, will surpass those in the voice-off condition, in which the instruction was given only visually.

III Motivation of this study

In short, discrepancies are apparent within the existing empirical studies. The studies conducted in spoken foreign language classrooms have shown the benefits of incorporating learners' L1 as a part of instruction. In contrast, the studies conducted in sign language classrooms have shown that the instruction using learners' L2, sign language, is more beneficial. Theoretically, the voice-on instruction should be more effective than the voice-off instruction, following the CTML, but this has not been confirmed yet due to the extremely small number of studies on this topic.

IV Research questions

The following research questions were developed to better understand how instructor's language choice influences learners' vocabulary learning in ASL.

1. Does the comprehension of signs by learners vary following a voice-on or voice-off instruction?
2. Does the production of signs by learners vary following a voice-on or voice-off instruction?

V Methodology

1 Participants

A total of 30 undergraduate students who were enrolled in an ASL course at a large public university participated in this study. Their average age was 22.55 years old (SD = 6.6), 24 of them were females, and six were males. All the students listed spoken English as their native language and identified themselves as hearing.[1] Of the participants in this study, several students reported having studied other foreign languages, including Spanish (21), Latin (3), French (1), or Arabic (1). Twenty-six students had taken three semesters of ASL, and four students indicated that they had an additional three to five years of exposure to ASL in addition to the three semesters leading up to their current course. All the participants completed the entire session. To keep the baseline of the participants as close as possible, the participants who scored higher than 50% in a comprehension pretest were excluded from the analysis, omitting four students from consideration in this study. Following these criteria, 26 participants were included for the analysis.

2 Target items

A total of 13 vocabulary items were included as a part of the instruction. All the chosen vocabulary was related to world geography. The first author selected those based on the contents of a unit from 'Signing Naturally- Level II,' which the learners were using in their class at the time of data collection (Lentz, Mikos, & Smith, 1992). The target vocabulary items were selected from a list of vocabulary from that curriculum.

3 Materials

The materials used for this study included (1) a background questionnaire, (2) narrative video and comprehension assessment, (3) productive assessment, and (4) treatment videos. The participants were initially tested on their knowledge of target vocabulary and were then taught using voice-on or voice-off instruction. After the treatment, the participants were immediately assessed on their comprehension and production of the target items, with a delayed posttest following six weeks later to assess comprehension and production

a Background questionnaire. A background questionnaire was given at the end of the study to acquire basic demographic information, including students' age, linguistic background, previous foreign language experience, and previous experience with ASL. The students were also asked if they reviewed the target items between the immediate and delayed posttests.

b Comprehension assessment. To assess the comprehension of target items, the learners watched a video narrative and responded to questions designed to elicit the target vocabulary. They were asked a total of seven comprehension questions that were distributed to each learner in a printed format. In the video, one of the researchers used ASL to discuss her travel history, including where her family had previously lived, where she was born,

where she had moved, and where she had visited during her time abroad. Learners were asked to respond to questions such as 'Where was I born?', 'Where did I live after my parents divorced?' and 'Where would I like to travel in the future?' Four questions contained a single target item response, while three questions were designed to elicit between two and four answers. For the questions eliciting multiple answers, the number of expected responses was indicated on the form. The students were asked to write their answers on the paper provided and to respond in written English. The duration of the video narrative was 1 minute and 20 seconds. All the target items were signed one time, and the students watched this video two times consecutively. This video was used for the pretest, immediate posttest, and delayed posttest.

c   Production assessment. For the productive assessment, the students individually recorded themselves in the Language Lab as they signed the target items. The vocabulary used for the comprehension and production tests was the same. Students were given a paper handout with a list of target items and were asked to consecutively sign the words.

d   Treatment videos. The students watched either a video containing voice-on or voice-off instruction. In the voice-off condition, the instructor provided the instructions using ASL, and both ASL and spoken English were used for the voice-on condition. For half of the items, the instructor showed the target vocabulary in ASL and the students assigned to voice-off condition saw the English spelling of the target vocabulary using fingerspelling (e.g. E-U-R-O-P-E) and those assigned to voice-on condition heard the equivalent English vocabulary (e.g. 'Europe'). The remaining signs were presented with the roots of the sign due to their iconic nature. For example, the iconic reference for the sign INDIA is a red dot (*bindi*) in women's forehead. For these items, the instructor first showed the target vocabulary in ASL, followed by fingerspelling (e.g. I-N-D-I-A), and explained its root using ASL in the voice-off condition. For the voice-on condition, on the other hand, the instructor showed the target vocabulary in ASL, mentioned the equivalent English word (e.g. 'India') and orally explained its root using spoken English. Though the language modalities used were different, the number of times each target item was fingerspelled or presented with spoken English was the same. It is important to mention that fingerspelling is a skill distinct from vocabulary learning. These learners had exposure to fingerspelling prior to this study and had basic skills and knowledge to be able to decode and interpret the fingerspelling as it related to the content of the instruction. Though an initial baseline was not gathered for fingerspelling proficiency, this study accounted for students' beginning fingerspelling ability by fingerspelling items twice and at a slow but fluid pace. Additionally, the words chosen for this study did not contain greater than eight letters per word and were all within the same semantic category in order not to overwhelm learners.

4 Procedure

The students were assigned a condition after choosing from a bag that contained slips of paper with the identification 'A' or 'B'. An equal number of options 'A' and 'B' were in

each bag, appropriate to the size of the class. The participants completed the comprehension pretest, treatment, and immediate comprehension and productive posttests on the same day. In the treatment, the students received instruction utilizing ASL only or a combination of ASL and spoken English through video. The instructional and assessment content was the same for each group, with differences only for treatment modality (voice-on or voice-off). The students immediately took a comprehension and production posttest, followed by a delayed posttest six weeks later.

5 Analysis

For the comprehension assessment, only one correct answer was possible for each question, as designed. For questions designed to elicit more items, the answers were weighted as 1 point per item. The items were scored as either correct or incorrect, and no deductions were taken for misspelling.

For the production assessment, the items were considered correct if the location, palm orientation, movement, and hand shape closely resembled the items taught in the treatment videos. Alongside one of the researchers, an external rater also rated the production assessments. The outside rater is a sign language interpreter and holds certifications at the master's level both nationally and by the State of Texas. The rate of agreement for the production assessments was 96%. The items that involved disagreement were discussed between the researcher and the rater until they reached an agreement. The items were scored as either correct or incorrect, and the students received 1 point for each correct item produced. The scored assessments were collected, and the ratio of correct to incorrect responses was calculated.

To assess the effectiveness of instruction, learners' scores were first compared across the two conditions using a repeated-measure ANOVA. Greenhouse–Geisser adjusted scores were used when the sphericity of the data was not confirmed according to Mauchly's Test of Sphericity.

VI Results

1 Comprehension test scores

First, we analysed the changes in the learners' comprehension test scores between two conditions. The descriptive statistics of test scores is shown in Table 1. Because Mauchly's Test of Sphericity did not confirm the sphericity of data ($p = .785$), Greenhouse–Geisser adjusted scores were used for the analysis. The results from a repeated-measure ANOVA showed that there was a significant time effect: $F (1.95, 47.02) = 85.00$, $p = .00$, $\eta^2 = .780$. Post-hoc paired sample T-tests showed that there was a significant improvement from the pretest to the immediate posttest, with $t (25) = -11.17$, $p = .00$, and a decline from the immediate posttest to delayed posttest, with $t (25) = 2.24$, $p = .03$. However, a significant improvement from the pretest to the delayed posttest was observed: $t (25) = -10.81$, $p = .00$. No significant Time X Condition effect or condition effect was seen: $F (1.95, 47.02) = 2.26$, $p = .11$, $\eta^2 = .08$, and $F (1, 48) = .044$, $p = .83$, $\eta^2 = .00$, respectively.

Table 1. Descriptive statistics of comprehension test scores.

Condition	Pretest (SD)	Immediate posttest (SD)	Delayed posttest (SD)
Voice-off	2.40 (1.35)	8.33 (3.67)	7.80 (3.25)
Voice-on	1.72 (2.00)	9.90 (2.21)	7.45 (3.20)

Table 2. Descriptive statistics of production test scores.

Condition	Immediate posttest (SD)	Delayed posttest (SD)
Voice-off	7.13 (3.97)	8.33 (3.67)
Voice-on	8.27 (2.19)	9.90 (2.21)

2 Production test scores

Second, we analysed the changes in the learners' production test scores. The descriptive test scores are shown in Table 2. Results from a repeated-measure ANOVA showed a significant time effect: $F(1, 24) = 6.84$, $p = .01$, $\eta^2 = .22$. However, the Time X Condition effect and condition effect were not significant: $F(1, 24) = .16$, $p = .69$, $\eta^2 = .00$, and $F(1, 24) = 1.34$, $p = .25$, $\eta^2 = .05$, respectively. In other words, the learners in both groups kept their improvements from the immediate to the delayed posttest in their production, and no difference in their productive performance between the two conditions was observed.

VII Discussion

The present study involved an inquiry about the efficacy of voice-on or voice-off instruction for the acquisition of sign language vocabulary. The results suggest that explicit instruction on vocabulary is beneficial for vocabulary acquisition in a sign language classroom. The students in both experimental conditions significantly improved over time for both comprehension and production. As reported in a number of studies, learners' attention is crucial to retain newly learned items (Anderson, 1995; Baddeley, 1997; Schmidt, 2000). It is, therefore, not surprising that learners benefited from the explicit vocabulary explanation in this study because their attention was constantly directed to target vocabulary. Although no measure of 'attention' or intention is used in this study, intentional vocabulary learning indeed benefits from attention to form-meaning connection, which seems to be encouraged by explicit vocabulary instruction (see Schmitt, 2008 for an overview of intentional learning of vocabulary).

Second, our results show that students were able to maintain their learning long term, in contrast to Tian and Macaro (2012), who found a lack of long-term effects of lexical focus on form. We speculate that this discrepancy came from different timing when administering the delayed posttest. Tian and Macaro employed a delayed posttest two weeks after the treatment, whereas it was administered a week after the treatment in the present study. Although we do not have data to confirm this, it is possible that the test scores may have dropped if the tests were administered later.

Third, the results of this study show no significant differences between the two conditions (voice-on and voice-off). This is surprising because it contradicts both the results of the existing studies that have investigated the effectiveness of instructional language, L1 vs. L2 and voice-on vs. voice-off instructions in particular, and the theories that account for the relationship between memory and multimodality. The existing empirical studies that have investigated the impact of using learners' L1 in foreign language vocabulary instruction have provided an overall favorable view on L1 incorporated instruction (Lee & Macaro, 2013; Tian & Macaro, 2012; Zhao & Macaro, 2016). If spoken English functions as hearing learners' L1, then the learners who received voice-on condition should have outperformed the voice-off condition. This was not the case in this study. The difference can be accounted for by comparing the types of target vocabulary. In Tian and Macaro's study, the researchers included less concrete and more advanced target vocabulary (e.g. *assume, capriciously* and *silhouette*), and the learners needed to truly understand the teachers' explanation to acquire them. On the contrary, our study solely focused on countries' names. In other words, the learners in our study may have had to make less effort in mapping the form and meaning of the target vocabulary, as no reconceptualization of new words was needed. Thus, the instructional language did not matter as much as we anticipated.

The results also contradict studies that have compared the effectiveness of voice-on and voice-off instruction. The existing studies, in contrast to the findings from a foreign language classroom, have shown that learners in the voice-off condition are better able to learn vocabulary items than those in the voice-on condition (see Boyle, 2011; Daley, 2011; as cited in Rosen et al., 2014). We speculate that these differences may have resulted from methodological variations used in the existing studies. Boyle (2011), for example, incorporated multiple modalities, such as visual explanations, pictures, and gestures in the voice-off condition, whereas the voice-on condition used fewer modalities; that is, spoken and written English. It is possible that these differences in the number of modalities in instruction may have affected learners' form-meaning mapping processes and resulted in better performance by the voice-off condition.

The lack of differences in the two conditions is theoretically surprising as well. Mayer's CTML argues that learners are able to learn more deeply when words are accompanied with visuals or pictures. According to this theory, a foreign language learner can create more memory codes (e.g. auditory, visual, and motor) with reduced reliance on separate cognitive channels, if the newly taught words are presented with corresponding pictures and gestures, and a learner can process and retain the target words better. Thus, we speculated that the learners from the voice-on condition would outperform those from the voice-off condition because the voice-on condition students received the input of vocabulary instruction in two modalities (signs represented visually and explained orally), which theoretically facilitates memory, whereas those in the voice-off condition utilized a single modality: signs (visual modality) only. However, that was not the finding for this study. The lack of superiority from the voice-on condition in comparison to the voice-off condition may because the learners may have had to go through an additional step to connect auditory input and the target vocabulary signs, which may have taken too much space in the beginning level learners' cognitive capacity and may

have resulted in less learning than anticipated. It is also important to mention that although the learners in this study were all hearing, they were not accustomed to receiving ASL instruction aurally. Additionally, the functions of visual modality in ASL and of spoken languages may not be entirely comparable because visual modality is the ultimate modality for sign languages whereas it could be rather supplemental (picture card, written words) for acquiring spoken languages. Further research should examine how hearing signers process signs and auditory input and how multimodality may affect their memory.

As is the case for any study, this research is not without limitations. Methodologically, the duration of the treatment was relatively short. Further empirical studies should implement a longer treatment period to better understand whether language choice truly impacts (or does not impact) the learners' comprehension and production ability of newly learned words over a semester or an academic year. In addition, this study utilized fingerspelling within the voice-off condition. Although we did not identify the differences between the two conditions, indicating that the learners were able to comprehend fingerspelling just as well as learners who received aural instructions, further studies may benefit from testing learners' ability to comprehend fingerspelling prior to conducting a study in a similar setting.

Another methodological issue is that the treatment sessions were via a video format rather than through face-to-face interaction. While this is useful for controlling the possible variables in instructions given across various classes (e.g. tone of voice, size of signing, and incidental questions from the students), a study in a face-to-face setting has greater ecological validity. Therefore, we suggest that future studies need to compare the effectiveness of the instructional modality as well.

Finally, the number of target items was rather small in the present study. Though consensus has not been reached regarding the optimal number of vocabulary items to teach in an instructional period, testing different numbers of target items should occur to see if differences arise as a result of students learning more vocabulary. In addition, the target items chosen for the present study were words within the same semantic category (location) and were all concrete nouns. Although this allowed us to keep the data consistent, the results may not be generalizable to all other vocabulary items and items of different parts of speech. It would be particularly worthwhile to investigate if the results of this study indeed varied from the existing studies due to the difference in target vocabulary types. Diversifying the numbers and types of target items in future studies may be beneficial for understanding ASL vocabulary learning.

VIII Conclusions

In the past decades, researchers in the field of SLA have identified the significance of instructional language on language learning in spoken and sign language classrooms. Specifically, the effect of learners' L1, spoken English, was not confirmed in this study, and we speculated that this is because of the methodological differences specifically concerning the timing of post-tests. This study also could not confirm the benefits of voice-off instruction as reported in studies by Rosen et al. (2014), and we argued that this difference may be due to another methodological difference; that is, the number

of modalities used in the voice-off instruction. From a theoretical point of view, using multiple modalities in instruction was assumed to promote learning. This study, however, was unable to confirm this. We speculated that this may be due to the differences between the modality of the instruction (auditory) and of the target language (sign). Learners' unfamiliarity with oral instruction in a sign language classroom may have also contributed to this discrepancy.

The present study was an initial investigation into the impact of language choice on the acquisition of iconic and arbitrary vocabulary in an ASL classroom. Overall, no significant differences between the voice-on and voice-off conditions were found. We are unable to argue that either instruction is better over the other based on the current results, and it is probably premature to do so due to the extremely small number of studies that have explored this topic to date. What we can suggest, however, as educators and researchers, is that it is essential to examine what instructional language works best for the specific student population based on empirical studies. Voice-off instruction is the norm in many sign language classrooms, though learners may benefit from receiving oral explanations when the instructor is explaining complex ideas or linguistic structures, while voice-off instruction may be indeed helpful for developing learners' fluency. In short, the differences in the effectiveness of instructional language in a sign classroom language are still unknown. This issue calls for further investigation with educators of sign languages to determine how voice-on and voice-off instruction can foster the acquisition of sign languages.

Acknowledgements

Funding

Note

1. As was also self-identified on the demographic survey, the researchers consider English, spoken and written, as students' first language for this study. The instruction, to be described in depth below, utilized in the voice-off group contains fingerspelling and signs. The researchers acknowledge that fingerspelling in ASL is based in part on the written English code but consider this a different linguistic feature when compared to the standard written English alphabet. Students would have needed to learn how to 'read' and decode fingerspelling just as they would have for any written text within spoken language. Fingerspelling is considered a distinct skill from written and spoken English and thus is categorized as a skill specific to sign language and the voice-off condition.

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