Comparing Instructional Reinforcements in Phonetics Pedagogy

Jennifer Abel, Heather Bliss, Bryan Gick, Masaki Noguchi, Murray Schellenberg, Noriko Yamane

University of British Columbia

1st International Symposium on Applied Phonetics
March 26, 2016
Chubu University, Japan
Phonetics taught as a discipline (Ashby 2008, Ashby & Ashby 2013)

Inclusion of a practical component (Ashby & Ashby 2013, Mills, Pollock & Tucker 2015)

Emergence of high tech teaching tools

• Nissen 2015 (using blended learning)
• Pons-Moll, Carrera-Sabaté, Blanco-Piñol & Gil-Bordes 2014 (using a website)
• Vassière 2003 (using a variety of in-class and online technologies)
• Verhoeven & Davey 2007 (using an online transcription practice tool)
Research Question

- However, to our knowledge there is no research directly comparing different instructional methods for teaching phonetics. The current study addresses that gap.
- We compare four different instructional reinforcements, i.e., learning tasks that supplement a classroom lecture on a phonetic contrast.
- Our research question is: which, if any, type of instructional reinforcement is the most effective for students to learn and retain the contrast?
2. Methodology

Structure of the experiment: Week 1

- Subjects: 152 students of Introductory Linguistics
- 4 groups of tutorials (4 conditions)
- Video-recorded lecture on a place-of-articulation contrast (palatal vs. velar vs. uvular)
- followed by one of instructional reinforcements
All students watched a videotaped lecture about a **place-of-articulation contrast (2’52”)**
2. Methodology

Instructional reinforcements: Week 1

(i) a baseline textbook-style handout explaining the contrast (n = 44 students)

(ii) classroom production practice, repeating after an audio recording in unison (n=43 students)

(iii) pairwise production practice, in which students practice contrasts and give each other feedback (n=21 students)

(iv) watching enhanced ultrasound videos illustrating the contrast (5’25’’). (introduction to ultrasound technology in Linguistics and three kinds of fricatives) (n=44 students)
2. Methodology

Instructional reinforcements: Week 1

(i) a baseline textbook-style handout explaining the contrast (n = 44 students)

(ii) classroom production practice, repeating after an audio recording in unison (n=43 students)

(iii) pairwise production practice, in which students practice contrasts and give each other feedback (n=21 students)

(iv) watching enhanced ultrasound videos illustrating the contrast (5’25’’). (introduction to ultrasound technology in Linguistics and three kinds of fricatives) (n=44 students)
2. Methodology

Textbook style

Keywords:
- The lower articulators and upper articulators
- Fricative
- Palate, velum, uvula

Diagram - Vocal tract with upper articulators labelled

... To summarize, speech sounds can vary depending on how and where the main obstruction in the mouth occurs. Fricatives are made when a lower articulator is positioned close to an upper articulator but does not block the airflow completely. When the main obstruction is created by the tongue moving towards the bony plate on the roof of the mouth known as the palate, a palatal sound is made. When the main obstruction is created by the tongue moving towards the soft area behind the palate, a velar sound is made. Finally, when the main obstruction is created by the tongue moving towards the appendage hanging down at the back of the throat, a uvular sound is made.
2. Methodology

Instructional reinforcements: Week 1

(i) a baseline textbook-style handout explaining the contrast
(n = 44 students)

(ii) classroom production practice, repeating after an audio recording in unison
(n=43 students)

(iii) pairwise production practice, in which students practice contrasts and give each other feedback
(n=21 students)

(iv) watching enhanced ultrasound videos illustrating the contrast (5’25’’). (introduction to ultrasound technology in Linguistics and three kinds of fricatives) (n=44 students)
2. Methodology

Instructional reinforcements: Week 1

(i) a baseline textbook-style handout explaining the contrast (n = 44 students)

(ii) classroom production practice, repeating after an audio recording in unison (n=43 students)

(iii) pairwise production practice, in which students practice contrasts and give each other feedback (n=21 students)

(iv) watching enhanced ultrasound videos illustrating the contrast (5’25’’). (introduction to ultrasound technology in Linguistics and three kinds of fricatives) (n=44 students)
2. Methodology

Instructional reinforcements: Week 1

(i) a baseline **textbook-style** handout explaining the contrast

(n = 44 students)

(ii) classroom production practice, repeating after an audio recording in unison

(palatal, velar, uvular)

(n=43 students)

(iii) **pairwise** production practice, in which students practice contrasts and give each other feedback

(n=21 students)

(iv) watching **enhanced ultrasound videos** illustrating the contrast (5’25’’). (introduction to ultrasound technology in Linguistics and three kinds of fricatives) (n=44 students)
Introduction to Ultrasound Technology in Linguistics
Assessment

2. Methodology

A quiz

- 2 perception questions (Q1, 2)
- 2 knowledge questions (Q3, 4)
Question 1 (Perception Question)

Which upper articulator (part of the mouth) is involved in making the following sound? (The instructor will play an audio file)

a. Alveolar ridge
b. Palate
c. Velum
d. Uvula
Question 1 (Perception Question)

Which upper articulator (part of the mouth) is involved in making the following sound? (The instructor will play an audio file)

a. Alveolar ridge  
b. Palate  
c. Velum  
d. Uvula

2. Methodology
Question 2 (Perception Question)

Which order correctly corresponds to the order in which the following sounds are played? (The instructor will play an audio file)

a. Palatal, Velar, Uvular
b. Velar, Palatal, Uvular
c. Uvular, Palatal, Velar
d. Uvular, Velar, Palatal
2. Which order correctly corresponds to the order in which the following sounds are played? (The instructor will play an audio file)

a. Palatal, Velar, Uvular
b. Velar, Palatal, Uvular
c. Uvular, Palatal, Velar
d. Uvular, Velar, Palatal
Question 3 (Knowledge Question)

Which type of sound is produced when the back of the tongue moves close to the soft area behind the hard palate, but does not obstruct the airflow?

a. Velar Stop  
b. Velar Fricative  
c. Uvular Stop  
d. Uvular Fricative
Which type of sound is produced when the back of the tongue moves close to the soft area behind the hard palate, but does not obstruct the airflow?

a. Velar Stop
b. Velar Fricative
c. Uvular Stop
d. Uvular Fricative
Which type of sound is represented in the diagram below?

a. Alveolar Fricative  
b. Palatal Fricative  
c. Velar Fricative  
d. Uvular Fricative
Question 4 (Knowledge Question)

Which type of sound is represented in the diagram below?

a. Alveolar Fricative
b. Palatal Fricative
c. Velar Fricative
d. Uvular Fricative
Structure of the experiment: Week 2

- At the beginning of the tutorial in the following week, the students did a second quiz (administered by the tutorial leader) to test their retention of the material
- Questions were the same, but in a different order
- Fewer students in total in this week (n=99)
3. Results

Table 1: Means, Standard Deviations and Numbers of Participants, Weeks 1 and 2

<table>
<thead>
<tr>
<th></th>
<th>Week 1</th>
<th>Week 2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Baseline (Text)</strong></td>
<td>2.87 (0.92); N=44</td>
<td>2.56 (1.05); N=39</td>
</tr>
<tr>
<td><strong>Unison Repetition</strong></td>
<td>2.79 (1.04); N=43</td>
<td>2.65 (1.17); N=17</td>
</tr>
<tr>
<td><strong>Pair Practice</strong></td>
<td>3.04 (0.92); N=21</td>
<td>2.67 (1.23); N=12</td>
</tr>
<tr>
<td><strong>Ultrasound Videos</strong></td>
<td>2.68 (1.2); N=44</td>
<td>2.39 (0.99); N=31</td>
</tr>
</tbody>
</table>
3. Results

![Mean Score (Total)]

- **Baseline (Text):** Week 1: 2.5, Week 2: 2.3 (44 participants)
- **Pair Practice:** Week 1: 3.0, Week 2: 2.7 (21 participants)
- **Ultrasound Videos:** Week 1: 2.8, Week 2: 2.6 (44 participants)
- **Unison Repetition:** Week 1: 3.0, Week 2: 2.8 (43 participants)

Number of participants in parentheses.
### Table 2: Knowledge Question Means and Standard Deviations

<table>
<thead>
<tr>
<th>Knowledge Questions (Q3 &amp; Q4)</th>
<th>Week 1</th>
<th>Week 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline (Text)</td>
<td>1.795 (0.461)</td>
<td>1.487 (0.683)</td>
</tr>
<tr>
<td>Unison Repetition</td>
<td>1.698 (0.558)</td>
<td>1.471 (0.717)</td>
</tr>
<tr>
<td>Pair Practice</td>
<td>1.952 (0.218)</td>
<td>1.333 (0.778)</td>
</tr>
<tr>
<td>Ultrasound Videos</td>
<td>1.545 (0.589)</td>
<td>1.645 (0.551)</td>
</tr>
</tbody>
</table>
3. Results

![Mean Score (Knowledge) chart]

- **Baseline (Text)**
- **Pair Practice**
- **Ultrasound Videos**
- **Unison Repetition**

Legend:
- **Week1**
- **Week2**
3. Results

Table 3: Perception Question Means and Standard Deviations

<table>
<thead>
<tr>
<th>Perception Questions (Q1 &amp; Q2)</th>
<th>Week 1</th>
<th>Week 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline (Text)</td>
<td>1.091 (0.91)</td>
<td>1.077 (0.839)</td>
</tr>
<tr>
<td>Unison Repetition</td>
<td>1.093 (0.868)</td>
<td>1.176 (0.728)</td>
</tr>
<tr>
<td>Pair Practice</td>
<td>1.095 (0.944)</td>
<td>1.333 (0.778)</td>
</tr>
<tr>
<td>Ultrasound Videos</td>
<td>1.136 (0.905)</td>
<td>0.742 (0.773)</td>
</tr>
</tbody>
</table>
3. Results

Mean Score (Perception)

- Baseline (Text)
- Pair Practice
- Ultrasound Videos
- Unison Repetition

Week 1

Week 2
Necessity of Engagement & Interactivity?

- **Engagement** (Chan 2015, Setter 2013, Smith 2011)

- **Interactivity** (Ashby & Ashby 2013)
  Including Pairwise practice (Gavaldá and Lundquist. 2007).

Ultrasound group:
- None of these reinforcements
- But they performed as well as the other groups

Future research (on April 1):
- Ultrasound + Engagement & interactivity
Conclusion

- While the availability of high tech teaching tools is not a guarantee of improved learning, it is not a hindrance either.

- We predict that exposing students to enhanced ultrasound videos via methods that are engaging and interactive would improve their learning outcomes.
Acknowledgements

• Students of LING100 at UBC, and its instructor Dr. Martina Wiltschko
• Centre for Teaching, Learning and Technology, particularly instructional designer, Dr. Bosung Kim
• Teaching and Learning Enhancement Fund at UBC
• A grant from the UBC Faculty of Arts
References


