

Using Learning Games for Phonetics and Phonology

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This talk is based in part on work done in collaboration with Professor Danielle Daidone from the University of North Carolina Wilmington. We have a forthcoming chapter set to appear in a book from Cascadilla Press on educational games in linguistics (edited by Professor Vita Kogan from University College London).



Danielle Daidone

Roadmap of the talk

1 Why games?

2 Why phonetics and phonology?

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4 Example #2: IPA Discard

5 Example #3: Flippity games

6 Example #4: Le Bingo Phonétique Français

Why games?

Why games?

active learning: activities that directly engage students in the process of learning (as opposed to the passive learning of traditional lectures)

Lots of research shows that active learning improves student performance (Hake 1998, Freeman et al. 2014, Michael 2006, etc.).

Why games?

PROBLEM! Despite the evidence, many instructors are reluctant to incorporate active learning into their teaching.

- ▶ (perception of) extra effort (Henderson and Dancy 2007)
- ▶ students may not *feel* they are performing better from active learning even when they are (Deslauriers et al. 2019)

So instructors often stick to traditional methods that are easier to implement and don't risk creating negative sentiments from students.

Why put in extra work and also take a hit to your course evaluations?

Why games?

Educational games have long been known to reap the benefits of active learning while solving the issue of student buy-in (Cruickshank and Telfer 1980, Lepper and Cordova 1992, Sugar and Takacs 1999, Massey et al. 2005, Ritzo and Robinson 2006, etc.).

As I show in the rest of this presentation, it can also be easy to implement games in the classroom, sometimes requiring little more than pencil and paper or adaptation of existing games.

Why phonetics and phonology?

Why phonetics and phonology?

On a superficial level, most any subject can have a game, since most course content can usually be converted into pairs for games based on question-answer, matching, collecting, etc.

In phonetics and phonology, we have many such pairs:

- ▶ voiceless alveolar fricative \Leftrightarrow [s] (*notation*)
- ▶ rate of vocal fold vibration \Leftrightarrow fundamental frequency (*definition*)
- ▶ raised velum, no nasal airflow \Leftrightarrow [–nasal] (*formal object*)

Why phonetics and phonology?

A notable example is Lynn Santlemann's (2000) IPA Bingo game, which has become a staple in many linguistics courses.

It's a straightforward implementation of Bingo, with rules that are easy to explain (and already familiar to many):

- ▶ cards with random set of symbols
- ▶ instructor secretly selects symbol
- ▶ instructor calls out definition or articulates phone
- ▶ students mark matching symbol
- ▶ students win with five in a row

IPA Bingo Game Card

Mark off the IPA symbols corresponding to the articulatory or feature description called. When you have marked 5 in a row in any direction (horizontally, vertically, or diagonally), call "Bingo!"

Remember: this card does not contain every IPA symbol used in English transcription. If a description called matches more than one symbol, mark off all matching symbols.

The star in the middle is a free square.

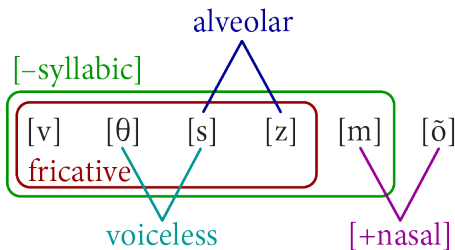
| | | | | |
|----|---|---|---|---|
| s | i | æ | ɪ | ŋ |
| ɹ | l | f | ʌ | w |
| ʒ | b | ★ | ʃ | p |
| tʃ | n | z | ɪ | k |
| ʊ | h | ɛ | ð | d |

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Why phonetics and phonology?

But phonetics and phonology content is not just a set of $A \Leftrightarrow B$ pairs.

There are **complex multidimensional overlapping structures** among IPA symbols, phonological features, and natural classes.



Why phonetics and phonology?

Direct use of these structures can result in more sophisticated games.

The extra sophistication can be more engaging for students, especially those who are gaming enthusiasts.

But more importantly, it allows the structure of the game itself to **reinforce the structure of the content** by requiring students to see more complex multi-pronged relationships.

Why phonetics and phonology?

I've created a bunch of games for phonetics and phonology of different types, all available on my website:

<http://sanders.phonologist.org/lxgames.html>

I'll go through some of them today to demonstrate how they work and discuss some of the underlying design principles.

Example #1: IPA Hunt

Example #1: IPA Hunt

Divide students into two teams (ideally 1–2 players each). Each team gets one gameboard made of two grids:

home grid

| | | | | | | | | | |
|----|----|----------|----------|----|----|----|----|----|----|
| i | y | <u>i</u> | <u>y</u> | ɨ | ɥ | ɯ | ɰ | ɸ | ɷ |
| ɨ | ɥ | ɯ | ɰ | ɨ | ɥ | ɯ | ɰ | ɸ | ɷ |
| e | ø | ɛ̃ | ø̃ | ə | ɘ | ɤ̃ | ö̃ | ɾ | o |
| ɛ̃ | œ̃ | ɘ̃ | ɘ̃ | ə̃ | ɘ̃ | ɘ̃ | ɘ̃ | ʌ̃ | ɔ̃ |
| ɛ | œ | ɛ̄ | œ̄ | ɜ | ɞ | ʌ̇ | ɔ̇ | ʌ | ɔ |
| æ | æ̃ | ǣ̃ | ǣ̃ | ɐ | ɐ̃ | ǣ̃ | ǣ̃ | ɑ̃ | ɒ̃ |
| a | œ | ä | œ̄ | ɐ̄ | ɐ̄ | ǟ | ȫ | ɑ̄ | ɒ̄ |

enemy grid

| | | | | | | | | | |
|----|----|----------|----------|----|----|----|----|----|----|
| i | y | <u>i</u> | <u>y</u> | ɨ | ɥ | ɯ | ɰ | ɸ | ɷ |
| ɨ | ɥ | ɯ | ɰ | ɨ | ɥ | ɯ | ɰ | ɸ | ɷ |
| e | ø | ɛ̃ | ø̃ | ə | ɘ | ɤ̃ | ö̃ | ɾ | o |
| ɛ̃ | œ̃ | ɘ̃ | ɘ̃ | ə̃ | ɘ̃ | ɘ̃ | ɘ̃ | ʌ̃ | ɔ̃ |
| ɛ | œ | ɛ̄ | œ̄ | ɜ | ɞ | ʌ̇ | ɔ̇ | ʌ | ɔ |
| æ | æ̃ | ǣ̃ | ǣ̃ | ɐ | ɐ̃ | ǣ̃ | ǣ̃ | ɑ̃ | ɒ̃ |
| a | œ | ä | œ̄ | ɐ̄ | ɐ̄ | ǟ | ȫ | ɑ̄ | ɒ̄ |



small group



small group



medium group



medium group



large group

Example #1: IPA Hunt

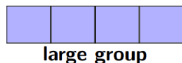
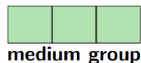
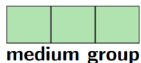
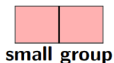
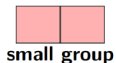
Each team chooses their own starting vowel groups (like Battleship ships). Must be contiguous and in a straight line. Two groups of two, two groups of three, and one group of four.

home grid

| | | | | | | | | | |
|---|----|----|----|----|----|----|----|---|---|
| i | y | ɨ | ɥ | ɪ | ʉ | ɯ | ʊ | ɰ | u |
| ɨ | ɥ | ɪ | ʉ | ɯ | ʊ | ɰ | ɰ | ɰ | ɰ |
| e | ø | ɛ̃ | ø̃ | ə | ə | ɤ̃ | ö̃ | ɣ | o |
| ɛ | œ | ɘ | ɘ̃ | ə | ɘ | ɘ̃ | ɘ̃ | ʌ | ɔ |
| ɛ | œ | ɛ̃ | œ̃ | ɜ | ɜ | ʌ | ɔ | ʌ | ɔ |
| æ | æ̃ | ǣ̃ | ǣ̃ | ɐ | ɐ̃ | ǣ̃ | ǣ̃ | ɑ | ɒ |
| a | œ | ä | œ̃ | ɐ̃ | ɐ̃ | ǣ̃ | ǣ̃ | ɑ | ɒ |

enemy grid

| | | | | | | | | | |
|---|----|----|----|----|----|----|----|---|---|
| i | y | ɨ | ɥ | ɪ | ʉ | ɯ | ʊ | ɰ | u |
| ɨ | ɥ | ɪ | ʉ | ɯ | ʊ | ɰ | ɰ | ɰ | ɰ |
| e | ø | ɛ̃ | ø̃ | ə | ə | ɤ̃ | ö̃ | ɣ | o |
| ɛ | œ | ɘ | ɘ̃ | ə | ɘ | ɘ̃ | ɘ̃ | ʌ | ɔ |
| ɛ | œ | ɛ̃ | œ̃ | ɜ | ɜ | ʌ | ɔ | ʌ | ɔ |
| æ | æ̃ | ǣ̃ | ǣ̃ | ɐ | ɐ̃ | ǣ̃ | ǣ̃ | ɑ | ɒ |
| a | œ | ä | œ̃ | ɐ̃ | ɐ̃ | ǣ̃ | ǣ̃ | ɑ | ɒ |



Example #1: IPA Hunt

Teams alternate trying to guess the vowel in their enemy's group by calling out a vowel somewhere from the grid.

The vowel must be specified enough to be uniquely identifiable, and must be specified with phonetic terminology.

For example, the vowel [œ] could be called out as “near-front lower mid round vowel” or as “retracted lax mid front round vowel”.

It would not be valid to call it out by grid position with something like “fifth row, fourth column”.

Example #1: IPA Hunt

If the called vowel is not part of an enemy's group, the enemy says "miss". Both teams should mark the appropriate grid with an X to indicate that that spot has been called and what the result was.

If the called vowel is part of an enemy's group, the enemy says "hit". Both teams should mark the appropriate grid with an O to indicate that that spot has been called and what the result was.

Example #1: IPA Hunt

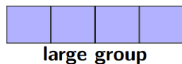
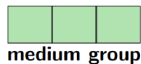
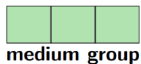
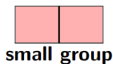
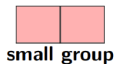
Possible gamestate after two turns, where the home team has called [ʊ] and scored a hit (marked with O on the enemy grid), while the enemy has called [œ] and scored a miss (marked with X on the home grid). The enemy team sheet would have these marks reversed.

home grid

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| i | y | ɨ | ɥ | ɪ | ɥ | ʉ | ʊ | ɯ | u |
| ɨ | ɥ | ɪ | ɥ | ɨ | ɥ | ʉ | ʊ | ɯ | u |
| e | ø | ɛ | œ | ə | ə | ɤ | ö | ɣ | o |
| ɛ | œ | ɛ | œ | ə | ə | ɤ | ö | ɣ | ɔ |
| ɛ | œ | ɛ | œ | ɜ | ɞ | ʌ | ɔ | ʌ | ɔ |
| æ | æ | ǣ | ǣ | ɐ | ɐ | ǣ | ǣ | ɑ | ɒ |
| a | œ | ä | œ | ɐ | ɐ | ǣ | ǣ | ɑ | ɒ |

enemy grid

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| i | y | ɨ | ɥ | ɪ | ɥ | ʉ | ʊ | ɯ | u |
| ɨ | ɥ | ɪ | ɥ | ɨ | ɥ | ʉ | ʊ | ɯ | u |
| e | ø | ɛ | œ | ə | ə | ɤ | ö | ɣ | o |
| ɛ | œ | ɛ | œ | ə | ə | ɤ | ö | ɣ | ɔ |
| ɛ | œ | ɛ | œ | ɜ | ɞ | ʌ | ɔ | ʌ | ɔ |
| æ | æ | ǣ | ǣ | ɐ | ɐ | ǣ | ǣ | ɑ | ɒ |
| a | œ | ä | œ | ɐ | ɐ | ǣ | ǣ | ɑ | ɒ |



Example #1: IPA Hunt

If a team calls out a vowel that results in a hit that completes a group, the enemy team must state that a group has been completely found and what size it is (small, medium, large).

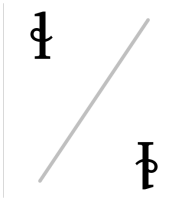
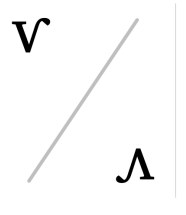
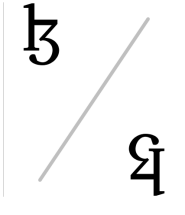
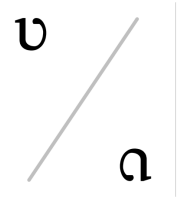
Such a hit allows the active team to immediately guess another vowel on their turn, and this can be chained again and again, as long each subsequent hit also completes a group.

The game ends when one team has found all the vowels in all five of the other team's groups.

Example #2: IPA Discard

Example #2: IPA Discard

Divide students into groups of about 4–5 with one deck of cards.

| | | |
|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|--------------------------------------------------------------|
|  |  | <p>waɪld</p> <p>rəpləs æktɪv kɑrd wɪθ [d] ɔr [x]</p> |
|  |  | <p>waɪld</p> <p>rəpləs æktɪv kɑrd wɪθ [ç] ɔr [ɣ]</p> |

Example #2: IPA Discard

Choose a starting player, who deals out five cards to each player in the group. The remaining cards are the draw pile.

The top card of the draw pile is flipped over to be the active card.

Beginning with the starting player, each player must play a card from their hand that matches the active card in either place or manner.

Example #2: IPA Discard

places: bilabial, labiodental, dental, alveolar, retroflex, alveolopalatal, palatal, velar, uvular, pharyngeal, epiglottal

manners: plosives, implosives, ejectives (stops and fricatives), clicks, nasal stops, pulmonic fricatives (incl. lateral), trills/taps/flaps (incl. lateral), approximants (incl. lateral)

Note that the game is intended for advanced students, so it has very few English phones!

Example #2: IPA Discard

If the player does not have a matching card in their hand, they must draw a card from the draw pile, and their turn ends (they cannot play the drawn card).

Play then continues to the next player going clockwise.

The game ends when one player plays the last card in their hand.

Example #2: IPA Discard

There are special wild cards that can be played on any active card. They require the player to declare the new active symbol from one of the two options on the card.

There are duplicates of some symbols in order to help balance the game. For example, there are only two alveolopalatals [ç] and [ʒ], so there are three copies of each in the deck to make them more able to match each other.

Blank cards are included to allow for customization of the game, such as adding English phones or special cards like reverse and skip.

Rule modifications can also liven up the game (e.g. because there are so many fricatives, require them to match in voicing, too).

Example #3: Flippity games

Example #3: Flippity games

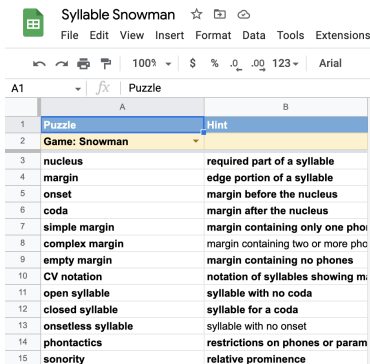
Steve Fortna has a free website called Flippity (2013–2024), with templates that allow easy creation of a variety of online games. Flippity is available at:

<https://www.flippity.net/>

Most of Flippity's games connect directly with Google sheets, so it's just a matter of filling in the relevant information and clicking the right buttons to “publish” the sheet and make it accessible to Flippity.

Example #3: Flippity games

Flippity has a set of word guessing games in the style of Hangman, using different themes that are a bit less problematic than the traditional version: picking apples off a tree, a melting snowman, etc.



The screenshot shows a Google Slides interface for a presentation titled "Syllable Snowman". The menu bar includes File, Edit, View, Insert, Format, Data, Tools, and Extensions. The toolbar shows navigation and editing icons, a 100% zoom level, and the font "Arial". The current slide is titled "Puzzle" and contains a table with 15 rows and 2 columns: "Puzzle" and "Hint". The second row is highlighted in yellow and contains a dropdown menu with "Game: Snowman" selected.

| | A | B |
|----|--------------------|-----------------------------------|
| 1 | Puzzle | Hint |
| 2 | Game: Snowman | |
| 3 | nucleus | required part of a syllable |
| 4 | margin | edge portion of a syllable |
| 5 | onset | margin before the nucleus |
| 6 | coda | margin after the nucleus |
| 7 | simple margin | margin containing only one pho |
| 8 | complex margin | margin containing two or more pho |
| 9 | empty margin | margin containing no phones |
| 10 | CV notation | notation of syllables showing m |
| 11 | open syllable | syllable with no coda |
| 12 | closed syllable | syllable for a coda |
| 13 | onsetless syllable | syllable with no onset |
| 14 | phontactics | restrictions on phones or param |
| 15 | sonority | relative prominence |

Example #3: Flippity games

flippity

Snowman

A O E S T N R M



🕒 2

🌨 0

💡 0

E M T M A R N

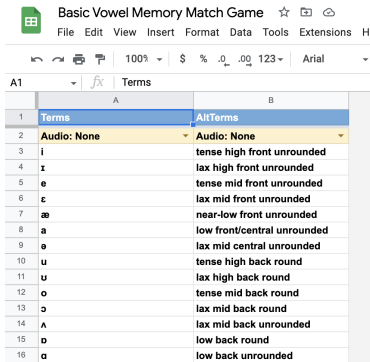


p



Example #3: Flippity games

Flippity also has a set of matching games similar to the card game Concentration, in which players must pick cards to form matching pairs. The same set of pairs can be used for either a straightforward matching game (with face-up cards) or a bit more challenging game requiring memory (with face-down cards).



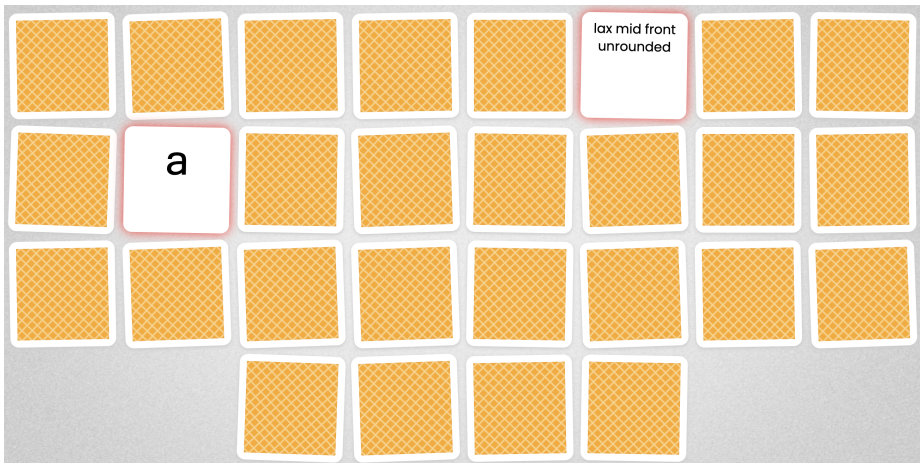
The screenshot shows a Google Sheet titled "Basic Vowel Memory Match Game". The sheet contains a table with two columns, A and B, and 16 rows. The first row is a header with "Terms" in column A and "AltTerms" in column B. The following rows list various vowel phonemes in column A and their corresponding descriptions in column B. The table is as follows:

| | A | B |
|----|-------------|-----------------------------|
| 1 | Terms | AltTerms |
| 2 | Audio: None | Audio: None |
| 3 | i | tense high front unrounded |
| 4 | ɪ | lax high front unrounded |
| 5 | e | tense mid front unrounded |
| 6 | ɛ | lax mid front unrounded |
| 7 | æ | near-low front unrounded |
| 8 | a | low front/central unrounded |
| 9 | ə | lax mid central unrounded |
| 10 | u | tense high back round |
| 11 | ʊ | lax high back round |
| 12 | o | tense mid back round |
| 13 | ɔ | lax mid back round |
| 14 | ʌ | lax mid back unrounded |
| 15 | ɒ | low back round |
| 16 | ɑ | low back unrounded |

Example #3: Flippity games

| | | | | | | | |
|---|---------------------------|----------------------------|-----------------------------|--------------------|-------------------------|-----------------------|--------------------------|
| a | lax mid back unrounded | tense high front unrounded | low front/central unrounded | ʊ | æ | tense high back round | lax high front unrounded |
| u | ə | lax mid central unrounded | ɒ | ɪ | low back round | lax mid back round | ɑ |
| e | tense mid front unrounded | o | ɛ | low back unrounded | lax mid front unrounded | ɔ | near-low front unrounded |
| | | tense mid back round | ʌ | i | lax high back round | | |

Example #3: Flippity games



Example #3: Flippity games

Lots of other options!

- ▶ flashcards
- ▶ Jeopardy-style quiz show
- ▶ locked questions
- ▶ bingo-card generator
- ▶ word search, crosswords, word scramble, Wordle, etc.

There are also some tools for **gamification**, which is using elements of gaming as part of the overall classroom environment: badge trackers, leaderboards, etc. Note that this is subtly different from using full games to aid learning, though they are obviously related and may blur together.

Example #4: Le Bingo Phonétique Français

Example #4: Le Bingo Phonétique Français

I have long been a fan of Santlemann's IPA Bingo, and I made my own version at some point in order to use the specific symbols I preferred.

Using my files as a base, I worked with Professor Fatima Hamlaoui from the University of Toronto's French Department to adapt IPA Bingo for French.



Fatima Hamlaoui

Le Bingo Phonétique Français

| | | | | |
|---|---|-------------------------------|---|---|
| y | f | l | ø | ɔ |
| w | v | t | ʁ | o |
| ẽ | d | <small>espas libʁ</small> | ɥ | ə |
| ʃ | g | s | m | i |
| z | ʒ | ã | ɛ | p |

Thank you!

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