# L2 English Pronunciation Assessment based on Social Network Analysis and the $i+1$ Input Hypothesis

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# L2 ENGLISH PRONUNCIATION ASSESSMENT BASED ON SOCIAL NETWORK ANALYSIS AND THE *i*+1 INPUT HYPOTHESIS

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ABSTRACT

*An individual's social network is a very important source of linguistic of input.   In this paper, we focus mainly on the linguistic input that students who are non-native speakers of English receive while studying at St. Cloud State University.   The university has 15,092 students, including 1,374 internationals, from eighty-nine countries[2].   We investigate the social network of five international students to see how much linguistic input they receive outside of normal instructional hours and if this input has any impact whatsoever on their pronunciation of English vowels.   The five interact with 20 people in their social networks, nine of whom are native speakers of English.   Cumulatively, the five participants spend 224 hours a week with the friends in their social network. Forty-five hours of these interactional times (20.08%) are with native speakers of English, while 153 hours (68.30%) are spent with people who speak the same native languages as the participants.   They also spend 26 hours (11.60%) speaking English with L2 speakers of English.   The findings are discussed in light of the Social Network Analysis (SNA) framework and Krashen's i+1 Input Hypothesis.*

## 1.0 Introduction

The assumption made in this paper is that the social network to which non-native speakers of English belong can help explain and even forecast the level of oral proficiency that they are likely to attain. To explore this further, we examine the social networks of five college students: one from Saudi Arabia, one from Argentina, one from Brazil, and two from El Salvador, who are studying at St. Cloud State University in Minnesota, USA.   Three co-authors write about their own social networks, while two co-authors report on the social networks of the people that they interviewed.   The length of residency (LOR) of the participants varies from three weeks to three years.   The common denominator among them is their stated desire to improve their pronunciation. Krashen's Input Hypothesis is used in tandem with the Social Network Analysis (SNA) framework to examine the interactional patterns of the participants and their possible impact on improving pronunciation.   The paper is organized into five mini studies, each of which describes the social network of the participant under consideration.

## 2.0 Research Question and Methodological

A questionnaire consisting of 14 items (see Appendix 1) was used to collect the data with the goal of answering the following question: Why do some international

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[1]This paper is a collection of five mini research projects written during the fall semesters of 2015 and 2016 in my Seminar in Sociolinguistics course.   I have edited them for the purposes of this publication.   The biosktches of the co-authors are found at the end of the article.

[2]The overall enrollment figure is from http://www.stcloudstate.edu/scsu4u/experience/.   Retrieved on January 05, 2017.   The enrollment data is for Fall 2016. The second is from http://today.stcloudstate.edu/the-world-attends-st-cloud-state-2016/. Retrieved on January 05, 2017

students improve their intelligibility but others do not even though they all study at at St. Cloud State University?   In attempting to answer this question, we consider all three aspects of Krashen's Input Hypothesis: the comprehensible input formula of *i*+1, which states that the linguistic input that the L2 learners receive must be slightly above their current abilities; the quality of input hypothesis, which states that input from native or proficient speakers is particularly useful for improving pronunciation; and the quantity of input formulation, which states that the more input L2 speakers receive, the more likely they are to convert it into output.

As noted previously, all the participants in this study want to improve their pronunciation. Three of them answered Question 13 of Appendix 1 by stating specifically that they wanted to improve their pronunciation of vowels, namely the lax vowels [ɪ, ʊ, ɛ, ɔ, æ, ʌ].   Two participants answered Questions 13 and 14 by noting that they wanted to improve their pronunciation in general.   Pronunciation is a vast area that includes the production of segments, suprasegments, rhythm, speech rate, and voice quality.   This paper examines only intelligibility issues that relate to the pronunciation of vowels. Vowels are so important to the intelligibility of English that Prator and Robinett (1985, p. 13) give the following piece of advice to non-native speakers, "If you wish to understand and be understood in English, you must be able to distinguish and make the distinction among the vowel sounds with accuracy."   The way we assess whether or not the participants in our study can meet their pronunciation goals is to compare and contrast their pronunciation of English vowels with those of native speakers, as provided by Peterson and Barney (1952).   We place our participants' vowels and those of General American English (GAE) of the same gender in the same vowel quadrant.   Ladefoged and Johnson (2015, p. 234) highly recommend using comparative vowel charts to assess the intelligibility of L2 English.   Cursory comments are made based on the acoustic vowel spaces to highlight problem vowels.    The actual acoustic measurements that made it possible to produce the acoustic vowel spaces are found in Appendix 2.   Praat (Boersma and Weenink 2010) was used for all the acoustic measurements, and the acoustic vowel spaces were produced using Norm (Erik and Kendall 2014).

### 2.1 Case Study 1: The Analysis of Angie's[3]  Social Network by Patrick Ridpath
For this study I interviewed Angie, a graduate student in the MA-TESOL program, who has been in the US for three years.   She is originally from Argentina and has been studying English since she was eight years old.   She rates herself as having a very high level of proficiency in English.   She uses English for most of her conversations with friends. Furthermore, as a Teaching Assistant, she spends many hours per week teaching English in the Intensive English Center (IEC).   This makes the quantity of input that she provides and receives very high.   Her greatest desire is to improve her pronunciation of vowels, especially of English lax vowels because they do not have their equivalents in Spanish.   Angie also gave me the names of her four closest friends at St Cloud State University.   The following grid summarizes their language backgrounds and interactions.

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[3]  Most participants are referred to by pseudonym so as to main anonymity.   In self-analyses, the authors refer to themselves by their first names, but letters such as A, B, C, etc. are used in reference to their participants.

|  | M | G | M | C |
|---|---|---|---|---|
| Country | Saudi Arabia | Puerto Rico | United States | United States |
| L1 | Arabic | English | English | English |
| Weekly amount of interactions in Hours | 10 | 10 | 7 | 4 |
| Context(s) | Social School | Social School Roommate | Social School | School |
| Language(s) Used | English | English/Spanish[4] | English | English |

Table 1: Participant in Angie's Social Network

Angie interacts 31 hours a week with the people in her social network; 26 of which are in English (83.87%) and 5 hours (16.12%) in Spanish. The 26 hours of interactional time spent with friends G, M, C qualify as quality input and meet the $i+1$ input requirement because these friends are native speakers of English.

Now that we have observed the quantity and quality of input that Angie receives, it might be good to evaluate where Angie's network falls on the Social Network Analysis (SNA) continuum.   For this, we turn our attention to Wardhaugh and Fuller (2015). Building off on Milroy's work on social networks, Wardhaugh and Fuller (2015, p. 71) give some definitions used in SNA. They state that a person's social network is **dense** if all people in it interact with one another.   If they do not, the social network is considered **loose**.   A social netwok is deemed **multiplex** if the people within it are tied together in more than one way; that is, not just through work but also through other social activities. Otherwise, it is a **simplex** network.   Abat and Koffi (2016:34-35) add that linkages within a social network can be **strong** or **weak**.   A strong linkage is one in which some people in a social network spend a lot of time together compared to other people in the same network.   Participants who spend a relatively smaller amount of time together are said to be weakly linked.   The strength of a linkage can be computed on the basis of the amount of time two or more people in the social network spend together.   In diagrams, linkage strength is indicated by bold lines that are adjusted for height so as to reflect the different shades of linkage strength. With these definitions in mind, let's interpret Angie's social network.

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[4]  The Puerto Rican speaker is a fluent bilingual.   For all practical purposes, she is a native speaker of English.   Given that they switch back and forth between English and Spanish, we conjecture that they spend 5 hours a week conversing in either language.
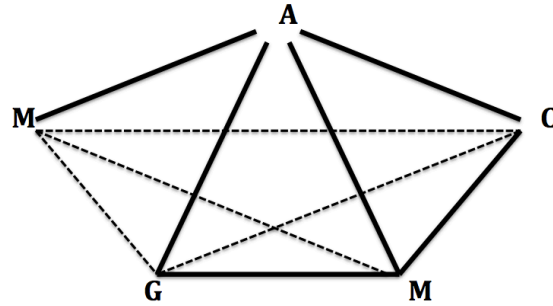
Figure 1: Angie's Social Network Diagram; A= Angie

I would describe Angie's social network as dense, strong, and multiplex.    It falls on the dense side of the continuum because all of her friends are also linked to each other. There is no one in her network that is only linked through her.    Her linkages with M and G are the strongest because they spend 10 hours a week together.    The next strongest linkage is with M (7 hours), and C (4 hours).    The linkages between M and G, M and M, G and C, and M and C are weak, as represented by dotted lines. Finally, Angie's social network is multiplex because she not only attends class with M, G, and M, but they meet in various other social settings.    Yet, Angie has a simplex network with C because they do not do much together after school.

**2.2 Proficiency Assessment**
Angie is fluent in English.    Her acoustic vowel space in Figure 2 shows that most of her vowels are intelligible:



Figure 2: Angie's Acoustic Vowel Space

Angie's acoustic vowel space shows that three pairs of vowels are likely to cause intelligibility problems. The vowels in questions are [u] vs. [ʊ], [o] vs. [ɔ], and [ɪ] vs. [e]. Even though she does not differentiate clearly between [u] and [ʊ], mispronouncing them is not likely to result in unintelligibility because their relative function is very low. In fact, there are no lexical minimal pairs for these two vowels in conversational English. The confusion between [o] vs. [ɔ] on the one hand, and [ɪ] vs. [e] on 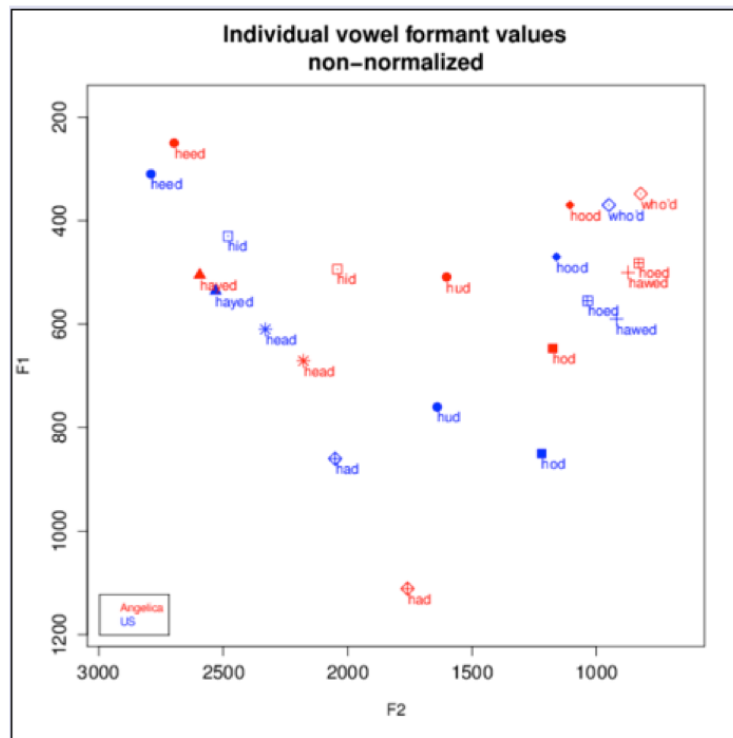the other, is more serious. Because, [o] and [ɔ] mask eacher other, when Angie says <boat>, it may be misperceived as <bought>, and vice versa. Similarly, when she says <hit>, it may be misinterpreted as <hate>, and vice versa.

Even though Angie has been living in the USA for three years, her inability to distinguish between [u] vs. [ʊ], [o] vs. [ɔ], and [ɪ] vs. [e] in production shows clearly that length of residency, quantity of input, quality, and the *i*+1 hypothesis do not correlate directly with improved pronunciation. One way Angie or anyone else can improve their pronunciation of English vowels is to do an audit of her vowels and display them visually in a chart such as the one in Figure 2. This gives her a clear picture of her vowels. Armed with this knowledge, she can give her friends G, M, and C permission to bring to her attention words in which she mispronounces the vowels [o] vs. [ɔ] and [ɪ] vs. [e]. Once her attention is drawn to the words containing these problematic vowels, she will do well to practice these words until she pronounces them intelligibly.

### 3.0 Case Study 2: A Social Network Self-Analysis by Thana al Jumaah

My name is Thana al Jumaah. It has been two weeks since I arrived in Saint Cloud, MN. I conducted the Social Network Analysis (SNA) project on myself. I was born in Saudi Arabia and lived there my whole life. Before answering the social network survey questions (see Appendix), I thought that the linkages in my social network would be weak and moderately loose because I have been in St. Cloud for only two weeks. However, it was surprisingly the opposite. Table 2 displays the people who are already in my social network:

| | A | B | C | D |
|---|---|---|---|---|
| Country of Origin | Saudi Arabia | South Korea | Somalia | United States |
| L1 | Arabic | English | English | English |
| Weekly amount of interactions in Hours | 3 | 2 | 4 | 2 |
| Context(s) | Social | Social School | Social School Religion | School School |
| Language(s) Used | Arabic | English | English[5] | English |

Table 2: The People in Thana's Social Network

The ways in which I relate to the people in my social network are reflected in Figure 2:

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[5] Friend C is a balanced bilingual in Somali and English. She is the first generation of Somali-born immigrants in St. Cloud.
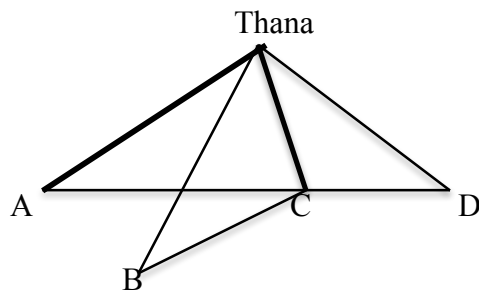
Figure 3: Thana's Social Network Diagram

My network is moderately dense because most of the participants know and interact with each other, except A and B on the one hand, and B and D on the other. Friend A knows and interacts with friend C. Moreover, B and C know each other because they are my classmates in two courses. However, my emergent networks seems to be stronger between A and me, and C and me.   I spend an average of seven hours with them every week.   Friends A, C, and I are in a multiplex network because we have classes together and interact with each other in several social activities.

Looking at Table 2, I notice that all my interactions with the people in my social network are in English except for A. I spend eight hours a week speaking English with them.   My friend D is the only native speaker so far.   I am confident that my interactions with B, C, and D will be good for improving my oral proficiency. However, this is not my primary concern for now.   My TOEFL score and other placement tests indicate that my level of proficiency in English is High.   Even so, I have noticed tremendous improvement in my listening skills since coming to the United States. My immediate goals are to improve my writing skills in academic English and to build up my academic vocabulary. There are several steps I have taken to improve my writing abilities and to increase my academic vocabulary.   Since all of my courses and textbooks are in English, I read a lot in English.   Completing course assigments will necessarily increase my academic vocabulary.   In order to improve my academic writing skills, I have made up my mind to write an essay every day.   I have also decided to avail myself of the opportunities that the Write Place offers.   I have begun to take advantage of one-on-one tutoring sessions that the consultants of St. Cloud State University's Write Place offer to help students edit their papers. This has helped me to be successful as I write papers for my classes. Mastering the skills to write academically is a long process that cannot be achieved overnight.   However, with the consultants' help and given the amount of reading that I'm doing in my graduate courses, and the time and hard work that I'm putting into it, I will achieve my goals.

## 3.1 Proficiency Assessment[6]
It is clear from the previous section that Thana is confident about her proficiency level in English.   She is more concerned about her academic English skills than her oral proficiency skills.   However, her vowel audit shows that she needs to pay attention to [ʊ, o, ʌ, ɑ], as shown in Figure 4:

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[6]This section was written by the first author on the basis of acoustic phonetic data provided by Thana.

Figure 4: Thana's Acoustic Vowel Space

Her [ʊ] can easily mask her [o] and vice versa because the two are acoustically very close.   When she pronounces <coke>, it can be confused with <cook>, and when she says <cook> her interlocutors may perceive it as <coke>.   Additionally, the pairs [ʌ] vs. [ɑ] can cause confusion.   As a result, <cot>/<caught> and <cut> may be mistaken for each other. Not being able to distinguish between [ɑ] and [ɔ] is no longer a liability because many speakers of American English do not discriminate between these two vowels anymore.   However, confusing [ʌ] and [ɑ] can interfere with intelligibility. Thana can enlist the help of friends C and D if she wants to improve her pronunciation of the four problem vowels in her L2 English.   She can pay attention to how her native speaker friends pronounce words that contain these vowels.   She can also ask for their feedback as to how accurately she produces them.    Thana can also benefit by learning to distinguish between [p] and [b] because she mispronounces <Praat> as <braat>.   The confusion between the two bilabial stops is common among Arabic speakers even when they have attained a high level of proficiency in English

**4.0 Case Study 3: The Social Network Analysis of Maria by Aizhan Arapova**
        My informant's name is Maria.   She is a 20-year-old student at Saint Cloud State University. She was born in Brazil and grew up there.   Her native language is Portuguese. In Brazilian schools, English is taught as a foreign language, and students only receive three hours of English instruction per week. Maria came to the United States three months ago with only a residual knowledge of English.   She enrolled at the Intensive English Center (IEC) of Saint Cloud State University where she received 30

hours of English instruction per week for three months. At the time of this study, she rated her English proficiency as Intermediate.

For my Social Network Analysis paper in Prof. Koffi's Sociolinguistics Seminar, I had Maria answer the Social Network Analysis survey questions in the appendix of this paper in order to determine the density, strength, and complexity of her social network and their possible impact on her English proficiency. Krashen's Input Hypothesis, especially his views on the quality and quantity of input that L2 learners receive form the backbone of my analysis. Maria's answers are reported in Table 3:

|  | B | C | D | E |
|---|---|---|---|---|
| Country of Origin | Korea | Brazil | Brazil | Brazil |
| L1 | Korean | Portuguese | Portuguese | Portuguese |
| Weekly amount of interactions in Hour | 10 | 10 | 7 | 10 |
| Context(s) | Social | Social | Social | Social School |
| Language(s) Used | English | Portuguese | Portuguese | Portuguese |

Table 3:The People in Maria's Social Network

The interactional patterns can be represented by the diagram below, where Maria' is A, and B, C, D and E represent the friends in her network:
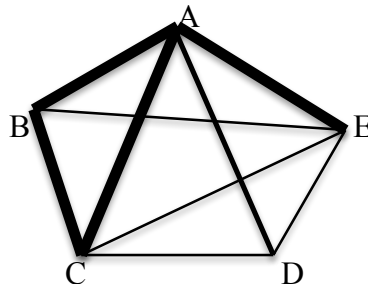


Figure 5: Maria's Social Network Diagram; A= Maria

Maria's social network is dense because all the people in it know each other well. However, her network is simplex because all her friends, except E, are tied to her in only one context: social events. She interacts with E in two contexts: academically and socially. Maria enjoyed strong linkages with B (10 hours), C (10 hours), and E (10 hours). Her linkage to D is somewhat strong (7 hours). All in all, Maria spends 37 hours of interactional time with her friends each week, 27 (72.97%) of which are only in Portuguese.

**4.1 Proficiency Assessment**
Maria graduated from the Intensive English Center (IEC), so she does not receive the 30 hours of intensive training in English that she used to get. Most of the English input that she receives outside of classroom settings comes from interacting with her Korean friend. Even though B has been living in the United States for 5 years and is fluent in English, the quality of the linguistic input that she provides does not completely meet the requirements of $i+1$. Yet, B is the only source of English input that Maria receives from

her network.    The 27 hours of social interactional time that she gets from the people in her network is spent speaking Portuguese with her Brazilian friends.

Maria's acoustic vowel space shows that she has a lot pronunciation challenges. First and foremost, her front vowels are centralized.    Secondly, she utilizes a restricted vowel space, which means that she does not open her mouth wide enough when she speaks.
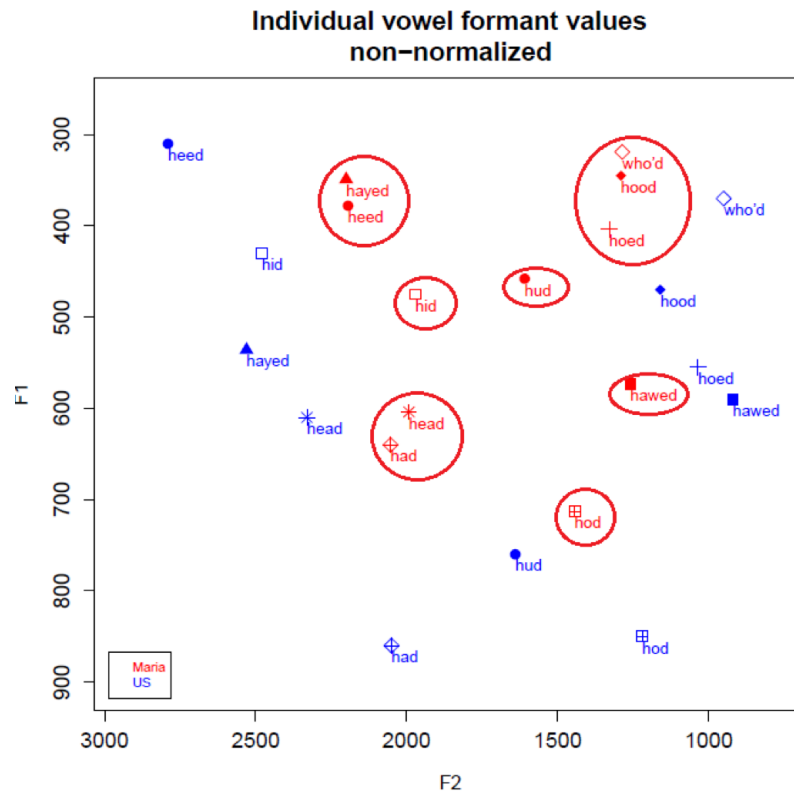


Figure 6:Maria's Acoustic Vowel Space

When Maria produces the vowel [i], GAE hearers may think that she is producing [e], and vice versa.    As a result, <heat> and <hate> may be sound identical. The confusion between the [u] and [ʊ] is also likely.    She also pronounces [ʊ] and [ʌ] nearly the same. Therefore, <look> and <luck> may be indistinguishable.    Her [ɔ] may be misperceived as [o], so much so that <boat> and <bought> may sound the same when she says them. Her front vowels [ɛ] and [æ] are so close together that when she says <had> people may think that she is saying <head>.    Maria has pronunciation problems with eight of the 11 phonemic vowels of English.

In response to items 13 and 14 on the survey (see Appendix 1) Maria noted that her English proficiency has improved since she enrolled at Saint Cloud State University. She credits the three months she spent at the IEC with much of the improvements that she made.    However, she also observed that her progress has stalled. She mentioned that she would like to keep improving her pronunciation, in order to communicate freely.

Based on the data presented above and my interactions with Maria, here are the steps that she will need to take to achieve her goal of improving her speaking abilities:

1) Maria is likely to remain in "intermediate slump" since 72.97% of her interactional time is spent with people who speak only Portuguese with her.
2) The quality of English input that Maria receives is questionable at best because the only person in her social network who provides this input is not a native speaker.   Maria should endeavor to expand her social network to include some native speakers of English.
3) Maria receives plenty of $i+1$ input from her professors who are for the most part native speakers of English.   She also receives $i+1$ input from classmates during the give and take that occurs in a typical American classroom.   Obviously, this source of input has not been beneficial to Maria.   What she needs is social encounters in which she gives permission to her native speaking friends to give her feedback on her pronunciation of words.
4) Maria also needs a setting like the IEC where she is asked to make presentations and where qualified teachers can give her positive feedback on her pronunciation of vowels.

**5.0 Case Study 4: A Social Network Self-Analysis by Karla Huezo**
My name is Karla.   I'm from El Salvador. My mother tongue is Spanish, and my second language is English.   I have been in the United States for eight months.   I am pursuing my MA in Teaching English as Second Language (TESL) at St. Cloud State University. I consider my proficiency in English to be very high although I am aware that I still have a lot to learn.   The areas that I would like to improve on the most are pronunciation and vocabulary.   My social network is comprised of four individuals: my boyfriend and three of my closest friends, as summarized in Table 4.

| | B | C | D | E |
|---|---|---|---|---|
| Country of Origin | United States | El Salvador | El Salvador | USA |
| L1 | English | Spanish | Spanish | English |
| Weekly amount of interactions in Hour | 16 | 80 | 12 | 8 |
| Context(s) | Social | Social School | Social School | Social School |
| Language(s) Used | English | Spanish/English | Spanish/English | Spanish/English |

Table 4:The People in Karla's Social Network

On average, I spend 116 hours a week interacting with my friends.   I noticed that 79.31% of my interactional time is spent speaking in Spanish.   However, I have the opportunity to speak English for at least two hours a day with my boyfriend (B) when I am not in school. This amounts to 20.68% of my interactional time.   He is from the United States and his mother tongue is English. He lives in another state, but we talk on the phone every day for a few hours. Our conversations are varied; they range from the most common things like daily activities to politics, finances, language acquisition, and business. Talking to him has made me realize that I need to work on the pronunciation of certain vowel and consonant sounds and vocabulary. He is learning to speak Spanish, so a small part of our conversation happens in Spanish.

Participant C is my friend and housemate. She is also from El Salvador and has been in the United States for eight months.   She is studying in the same program as I. I spend most of my time with her, and since both of us speak Spanish, we prefer to make it our primary language of communication. I spend most of my time with her at home and at school because we are classmates.   I spend 68.96% of my interactional time speaking Spanish with her. We only speak English when somebody who does not speak Spanish is present.

Participant D is also a friend of mine.   He is from El Salvador and his mother tongue is Spanish.   He too arrived in the US eight months ago.   He is also a student in the TESL graduate program. I spend only 12 hours a week with him because he lives far from me. We meet in class, and sometimes we go out to dinner, or he comes over to the apartment to visit. When we are together, we mainly speak Spanish.

Participant E is from the United Sates.   His mother tongue is English. We met eight months ago when we started the TESL program. We meet in class, and we occasionally go out with other friends or visit each other. Since he only speaks English, my conversations with him are 100% in English. My interactions with him give me the chance to learn new vocabulary items.   I also tend to monitor my pronunciation of vowels and consonants when I talk to him.
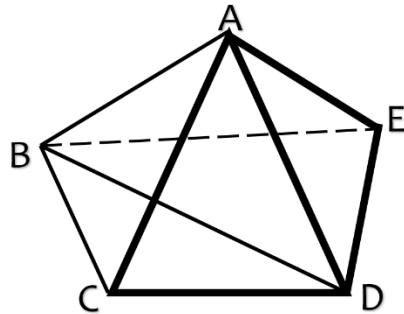


Figure 7: Karla's Social Network Diagram; A= Karla

Eighty percent of the people in my social network know and interact with each other; but B and E have never met, though they both have heard of each other.   My social network is mostly dense, multiplex, and strong.   It is highly multiplex because the actors are related "in more than one way, that is, not just through work but also through other social activities" (Wardhaugh and Fuller, 2015 p. 71).   Friends A, C, D and E interact in school activities and in other social activities.   However, one linkage (A and B) is simplex since the interaction between them is only social.   My social network is also strong.   My linkage with C is the strongest because we spend 80 hours per week together, followed by B (16 hours), and D (12 hours).

### 5.1 The Input Hypothesis
In his Input Hypothesis, Krashen (1985) states that for a L2 speaker's proficiency to develop, there needs to be exposure to input that is slightly beyond the speaker's current level of competence ($i+1$).   My social network provides me with 24 hours a week of $i+1$

input in English.    I receive additional *i+1* English input at school from my professors, and a sizeable contingent of native speakers of English in the TESL program. However, the fact that I spend 79.31% of my interactional time communicating in Spanish reduces the amount of conversational *i+1* input that I would otherwise receive if more people in my network spoke English.

**5.2 Proficiency Assessment**
     Even though I am exposed to 24 hours of English produced by native speakers, I have realized that quantity and quality of input are not enough to see the kind of improvement in my pronunciation as I had hoped for. As noted previously, the ways in which I produce some vowels and consonants cause my interlocutors to misunderstand me at times. The vowels that cause problems are those that do not have their equivalent in Spanish.    My acoustic vowel space in Figure 8 has confirmed what I already know and what others have told me:
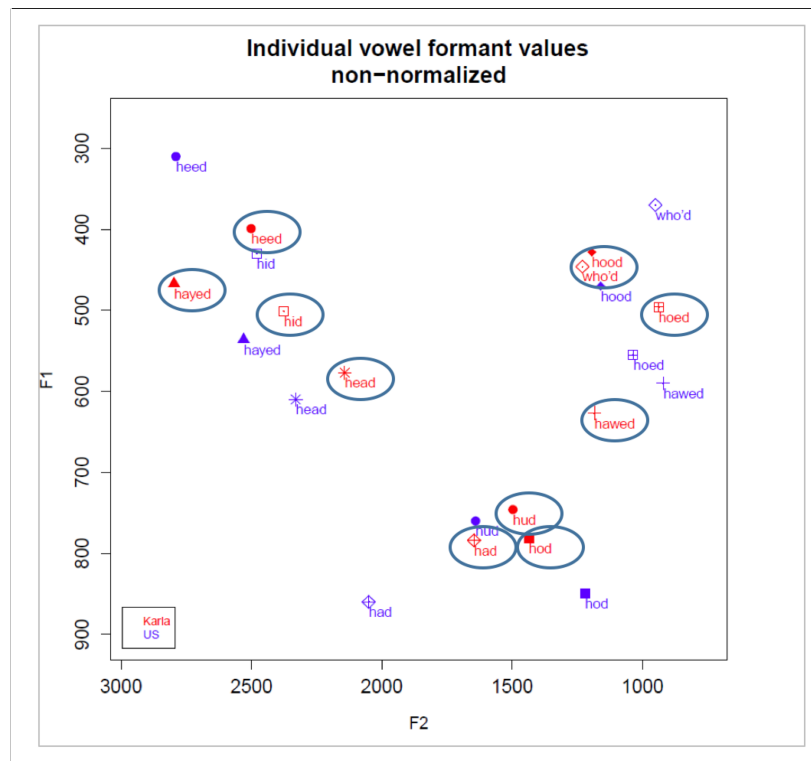


Figure 8: Karla's Acoustic Vowel Space

Five vowels pairs are challenging because I have a hard time producing them distinctly. The pairs in question are [u] vs. [ʊ], [i] vs. [ɪ], [æ] vs. [ɑ], [æ] vs. [ʌ], and [ʌ] vs. [ɑ]. My boyfriend brings pronunciation errors that lead to unintelligibility to my attention. For example, I was surprised to learn that the first vowels in <tongue> and <tongs> are pronounced differently.    When this happens, I practice pronouncing the words until I get them right. The Social Network Analysis project has made me realize that the mere exposure to correct pronunciation is not enough to turn input into output. Now that I am aware of this, there are three steps that I can take to improve my pronunciation.    First, since I now have a clear picture of the sounds that cause intelligibility problems, I'm

determined to pay close attention to how native speakers pronounce the vowels that I have a hard time producing so that I learn to hear them and produce them naturally and effortlessly.   Secondly, as far as vocabulary acquisition is concerned, I need to step out of my comfort zone and use the new words that I learn in my sentences.   Finally, I want to make an effort to interact with C and D not only in Spanish, but also in English.

**6.0 Case Study 5: A Social Network Self-Analysis by Joel Coreas**
        My name is Joel Coreas and I am from El Salvador. My native language is Spanish. I am 31 years old. I am a graduate student at St. Cloud State University and I have been living in the US for 8 months. As a new student in the US, I must say I spend most of the time by myself.   However, I have some friends and some acquaintances. The people in my social network and the ways in which I interact with them are displayed in Table 5:

|  | B | C | D | E |
|---|---|---|---|---|
| Country of Origin | El Salvador | El Salvador | USA | USA |
| L1 | Spanish | Spanish | English | English |
| Weekly amount of interactions in Hour | 8 | 8 | 2 | 1 |
| Context(s) | Social School | Social School | Social School | Small talks |
| Language(s) Used | English | Spanish/English | English | English |

Table 5:The People in Joel's Social Network

My friends B and C are females students from El Salvador.   We came to the US through the same program and we are all enrolled in the same TESL MA program at St. Cloud State University.   I spend 16 hours a week with them.   All in all, I spend 19 hours a week with the people in my network, and 84.21% of which are with my friends from El Salvador.   The rest of the time I spent with friend D (2 hours) and "friend" E (1 hour). I know friend D because we have been classmates for two semesters. He is the native English speaker I interact the most with.   Friend E is my housemate.   D and E do not speak Spanish.   So, my interactions with them are always in English.   In other words, I spend 15.78% of my weekly interactions speaking to them in English.   They are the only people in my network who provide me with $i$+1 conversational input. B and C know D as well as I do because we are classmates in the same program. B and C do not know E, but they know about him. D and E do not know each other and they do not know about each other either.

        Based on this information my social network can be described both as dense and loose.   It is dense between me, B, C, and D because we all interact with each other (Wardhaugh and Fuller 2015).   However, my network is loose because B and C, do not interact with E.   In fact, they have never met E even though they have heard of him. This explains why the linkages between B and E and C and E are represented by broken lines.   D has never heard of E. This is the reason why they are not linked at all, as seen in Figure 9:
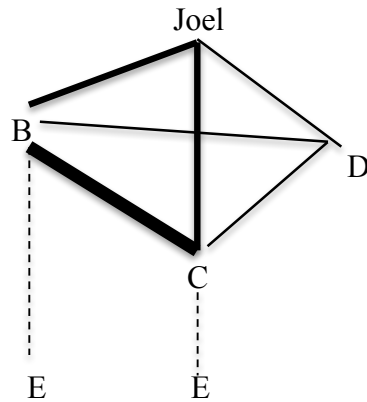
Figure 9: Joel's Social Network Diagram[7]

My network with B, C, and D can be described as multiplex because in addition to taking classes together, we also interact socially (Wardhaugh and Fuller 2015). Within my social network, B and C are more strongly linked than B and me, or C and me. My linkage to them is of equal strength. My network is simplex when it comes to E. My interactions with him are limited to small talks. My linkage to him is also very weak.

**6.1 The Input Hypothesis**
Overall, according to Milroy and Milroy (1992) and to Krashen's Input Hypothesis, I am not part of a social network that can lead to great progress in L2 pronunciation. However, my English proficiency was already high prior to coming to study at St. Cloud State University. This assessment is based on my TOEFL scores and on the fact that I'm a graduate assistant in the Intensive English Center (IEC). Yet, I would like to improve my pronunciation because there are certain sounds that are difficult for me to produce intelligibly. The sounds in question are displayed in Figure 10:

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[7] The dotted lines mean that B and C have only heard of E through Joel.

Figure 10: Joel's Acoustic Vowel Space

The English vowels that I have some difficulty producing do not exit in Spanish.    The acoustic vowel space shows that when I produce [ɪ], it is sometimes confused with [e]. The vowels that are the most difficult for me are [ʌ] vs. [ɑ].    My [ʌ] and [ɑ] are completely indistinguishable.    The acoustic vowel space shows that they are literally on top of each other.    This means that when I say <cut> and <cot>, people are unsure what I mean.    The ways in which I pronounce [o] can be misperceived by GAE hearers as [ʊ].

**6.2 Personal Recommendations and Action Plan**
        I realize that the key to improving the production of these troublesome vowels may lie in the quality and quantity of English input that I receive from people inside and outside of my social network.    Krashen refers to comprehensible input as an important element in the acquisition of any language. This process takes place subconsciously and he states that productive skills evolve from receptive skills and that both should be emphasized in language acquisition. He also notes that acquisition happens when comprehensible input is turned into output (Krashen 1985).    Since 84.21% of the interactions in my social network take place in Spanish, it means that I do not receive enough quality $i$+1 input in English which could help me improve my pronunciation of problem vowels. My interactions with the native speakers in my social network is woefully inadequate to bring about the pronunciation gains that I desire.    I have made up my mind to remedy this situation by following two courses of action.    The first includes

increasing my interactional time with D and E.   Doing so, will provide me with more *i*+1 conversational input with people who are already inside my network.   My second action plan is to balance my interactions with B and C.   Instead of speaking in Spanish most of the time, I can put the *i*+1 input that I receive from D and E into practice when talking to B and C.   This would give me the opportunity to turn input into output.

**7.0 Summary**
    There are 25 people involved in the various social networks examined in this paper, but only 9 of the participants are native speakers of English even though there are more than 13,000 domestic students at St. Cloud State. The non-native speakers in our study spend on average 224 hours in weekly interactions with the people inside of their social networks.   Their interactional times are divided as follows: 45 hours spent speaking with native speakers (20.08%), 153 hours (68.30%) with people from their own native language groups, and   26 hours (11.60%) with other non-native speakers.   This social network analysis has highlighted interactional patterns that are, according to Kolowhich (2017), a microcosm of social networks on campuses across the USA.   He observes that "Here [i.e. St. Cloud State University], just as on many campuses, those white students can still sail through four years without spending significant time with people whose backgrounds differ greatly from their own." Many international students lament the fact that they cannot develop friendships with American students outside of the classroom. They complain that friendships with American students are "shallow" and do not go beyond routine polite exchanges and greetings.   This may, indeed, be the case.   But international students are not blameless.   The data shows that the vast majority of them tend to congregate around other international students who speak the same native language as they do.   When the participants in this study were presented with the results of this study, they all vowed to be intentional about including native speakers of English into their social networks.   If they follow through on their resolutions, their friendships with native speakers will pay cultural dividends.

    The data, limited though it is, does not seem to support Krashen' Input Hypothesis, nor does it uphold the view that dense, multiplex, strong, and diverse social networks improve the pronunciation of L2 speakers of English.   If they did, Angie would not still be having problems producing the vowels [ɪ], [ʊ], and [ɔ] intelligibly.   Her social network consists of three native speakers with whom she spends 26 hours a week (83.87%). She receives not only quality *i*+1 input from them, but a large quantity of *i*+1 input in Engish. Furthermore, she has been studying at St. Cloud State University for three years.   We also know all this is evidence that merely receiving or being exposed to quantity and quality of *i*+1 input in English from native speakers does not translate automatically into an improvement in pronunciation, especially the pronunciation of vowels. Phoneticians concur that English vowels are notoriously difficult to teach or describe (Ladefoged and Johnson 2015, pp. 20-21, Fromkin and Rodman 1998, p. 235). Our experience indicates that what seems to work, first and foremost, is for L2 speakers of English to receive an audit of their L2 English vowels (see Abat and Koffi 2016). Acoustic vowel spaces such as the ones shown and discussed in this paper give L2 speakers the ability to visualize their vowels in relation to those produced by the speakers of General American English (GAE).   Once they have noticed the differences and

similarities between the two vowel systems and have been made aware of which of their vowels mask each other or mask GAE vowels, then they can be taught how to produce the problem vowels intelligibly.   The teaching can be formal or informal. Pronunciation teachers can use the information to help L2 talkers meet their pronunciation goals.   L2 talkers can take hold of this information and give permission to the native speakers in their social networks to bring to their attention the words that, when they mispronounce, can cause unintelligibility.   L2 speakers can practice the problem segments until they produce them effortlessless, subconsciously, and intelligibly. This is how the *i*+1 input and social network can work in tandem to benefit non-native speakers of English.

## ABOUT THE AUTHORS

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**Appendix 1: Social Network Analysis**

**Research Question:** Can Krashen's Input Hypothesis be used in tandem with Social Network Analysis to explain why some international students at St. Cloud State University improve their pronunciation better than others?

**Three Important Tenets of Krashen's Input Hypothesis and L2 Acquisition:**

1. **Comprehensible Input and the *i* +1 Formula:** For L2 learners to make progress, they must be provided with input that is slightly above their current proficiency level. The input they receive must be comprehensible, but it must also contain some elements that the learner does not know.

2. **Quantity of Input tends to correlate positively with proficiency in L2:** Everything being equal, a person who receives more input in the L2 from native and near native speakers is more likely to transform that input into intake than a person who receives less input from similar sources.

3. **Quality of Input tends to correlate positively with proficiency in an L2:** Everything being equal, a person who receives input in the L2 from native speakers will improve his/her pronunciation and intelligibility more than a person who receives his/her input from non-native speakers.

**Research Methodology**
1. Select 1 international student/person. Preferably somebody who has been in the USA less than 3 years.
2. Indicate the level of your informant: What grade is he/she in at IEC? Or, what is his/her level of proficiency: beginner, intermediate, advance?
3. Ask your informant to name **4** persons that he/she knows best at SCSU, in Saint Cloud, or in the community where you live. Your presentation need not contain the last names of the persons. Made-up names will suffice. However, their native tongue and nationality are relevant for this analysis. Your participants MUST NOT include family members in their social network.

Have your informant answer the following questions:

1. How old are you? Check One

| 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28+ |
|----|----|----|----|----|----|----|----|----|----|----|-----|

2. What is your home language (mother tongue)?

3. What other languages do you speak?

4.  Where did you live when you were a child?


5.  How long you have been in the USA


6.  Name 4 people you consider to be your best friends:

|  | Friend 1 | Friend 2 | Friend 3 | Friend 3 |
|---|---|---|---|---|
| Country of origin |  |  |  |  |
| Native language |  |  |  |  |

7.  How many hours per week do you spend with friend 1

| <30mn | 1h | 2h | 3h | 4h | 5h | 6h | 7h | 8h | 9h | 10h |
|---|---|---|---|---|---|---|---|---|---|---|

8.  How many hours per week do you spend with friend 2

| <30mn | 1h | 2h | 3h | 4h | 5h | 6h | 7h | 8h | 9h | 10h |
|---|---|---|---|---|---|---|---|---|---|---|

9.  How many hours per week do you spend with friend 3

| <30mn | 1h | 2h | 3h | 4h | 5h | 6h | 7h | 8h | 9h | 10h |
|---|---|---|---|---|---|---|---|---|---|---|

10. How many hours per week do you spend with friend 4

| <30mn | 1h | 2h | 3h | 4h | 5h | 6h | 7h | 8h | 9h | 10h |
|---|---|---|---|---|---|---|---|---|---|---|

11. Here (on campus), which language do you usually use when you
a.  are eating your meals?     _____
b.  are (doing exercises)?     _____
c.  are in the classroom?     _____
d.  speak to a (professor)?     _____
e.  talk to your friends?     _____

12. How do you rate your proficiency in English?    Check one
  • Very high     _____
  • High _____
  • Intermediate     _____
  • Low _____

13. Which area of your English proficiency would you like to improve on the most?
    _____
14. Why?

## Appendix 2: Acoustic Correlates

| Words | | heed | hid | hayed | head | had | hod | hawed | hoed | hood | who'd | hud |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Vowels | | [i] | [ɪ] | [e]8 | [ɛ] | [æ] | [ɑ] | [ɔ] | [o] | [ʊ] | [u] | [ʌ] |
| GAE | F0 | 235 | 232 | 219 | 223 | 210 | 212 | 216 | 217 | 232 | 231 | 221 |
| Angie | F0 | 238 | 239 | 195 | 218 | 260 | 261 | 257 | 215 | 300 | 277 | 221 |
| GAE | F1 | 310 | 430 | 536 | 610 | 860 | 850 | 590 | 555 | 470 | 370 | 760 |
| Angie | F1 | 250 | 494 | 505 | 671 | 1111 | 647 | 500 | 482 | 370 | 348 | 509 |
| GAE | F2 | 2790 | 2480 | 2530 | 2330 | 2050 | 1220 | 920 | 1035 | 1160 | 950 | 1640 |
| Angie | F2 | 2697 | 2041 | 2594 | 2177 | 1759 | 1175 | 873 | 830 | 1106 | 822 | 1602 |
| GAE | F3 | 3310 | 3070 | 3047 | 2990 | 2850 | 2810 | 2710 | 2828 | 2680 | 2670 | 2780 |
| Angie | F3 | 3049 | 2766 | 3245 | 2865 | 2703 | 3080 | 3212 | 3187 | 3174 | 3190 | 2961 |
| GAE | DUR | 306 | 237 | 320 | 254 | 332 | 323 | 353 | 326 | 249 | 303 | 226 |
| Angie | DUR | 302 | 222 | 446 | 201 | 198 | 220 | 304 | 364 | 208 | 365 | 177 |
| Angie | Ints | 55 | 59 | 52 | 56 | 58 | 60 | 58 | 57 | 58 | 57 | 56 |

The Acoustic Correlates of Angie's Vowels

| Words | | heed | hid | hayed | head | had | hod | hawed | hoed | hood | who'd | hud |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Vowels | | [i] | [ɪ] | [e] | [ɛ] | [æ] | [ɑ] | [ɔ] | [o] | [ʊ] | [u] | [ʌ] |
| GAE | F0 | 235 | 232 | 219 | 223 | 210 | 212 | 216 | 217 | 232 | 231 | 221 |
| Thana | F0 | 233 | 247 | 234 | 231 | 233 | 211 | 223 | 228 | 263 | 250 | 246 |
| GAE | F1 | 310 | 430 | 536 | 610 | 860 | 850 | 590 | 555 | 470 | 370 | 760 |
| Thana | F1 | 338 | 607 | 443 | 746 | 898 | 806 | 788 | 502 | 515 | 440 | 823 |
| GAE | F2 | 2790 | 2480 | 2530 | 2330 | 2050 | 1220 | 920 | 1035 | 1160 | 950 | 1640 |
| Thana | F2 | 2821 | 2198 | 2805 | 2098 | 1876 | 1586 | 1593 | 1632 | 1440 | 1249 | 1690 |
| GAE | F3 | 3310 | 3070 | 3047 | 2990 | 2850 | 2810 | 2710 | 2828 | 2680 | 2670 | 2780 |
| Thana | F3 | 3335 | 3116 | 3331 | 3100 | 3115 | 3024 | 2983 | 2945 | 2945 | 2687 | 3177 |
| GAE | DUR | 306 | 237 | 320 | 254 | 332 | 323 | 353 | 326 | 249 | 303 | 226 |
| Thana | DUR | 424 | 208 | 489 | 219 | 366 | 243 | 491 | 365 | 171 | 477 | 159 |
| Thana | Ints | 67 | 67 | 66 | 67 | 67 | 66 | 68 | 67 | 70 | 67 | 68 |

The Acoustic Correlates of Thana's Vowels

| Words | | heed | hid | hayed | head | had | hod | hawed | hoed | hood | who'd | hud |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Vowels | | [i] | [ɪ] | [e] | [ɛ] | [æ] | [ɑ] | [ɔ] | [o] | [ʊ] | [u] | [ʌ] |
| GAE | F0 | 235 | 232 | 219 | 223 | 210 | 212 | 216 | 217 | 232 | 231 | 221 |
| MARIA | F0 | 244 | 233 | 235 | 207 | 218 | 213 | 186 | 217 | 195 | 184 | 231 |
| GAE | F1 | 310 | 430 | 536 | 610 | 860 | 850 | 590 | 555 | 470 | 370 | 760 |
| MARIA | F1 | 378 | 475 | 349 | 604 | 640 | 713 | 573 | 404 | 345 | 319 | 458 |
| GAE | F2 | 2790 | 2480 | 2530 | 2330 | 2050 | 1220 | 920 | 1035 | 1160 | 950 | 1640 |
| MARIA | F2 | 2194 | 1971 | 2200 | 1992 | 2053 | 1443 | 1259 | 1329 | 1290 | 1286 | 1609 |
| GAE | F3 | 3310 | 3070 | 3047 | 2990 | 2850 | 2810 | 2710 | 2828 | 2680 | 2670 | 2780 |
| MARIA | F3 | 3076 | 2651 | 2938 | 2687 | 2839 | 2791 | 2843 | 2781 | 2741 | 2660 | 2709 |
| GAE | DUR | 306 | 237 | 320 | 254 | 332 | 323 | 353 | 326 | 249 | 303 | 226 |
| MARIA | DUR | 218 | 178 | 308 | 234 | 199 | 204 | 198 | 265 | 188 | 193 | 207 |
| MARIA | Ints | 77 | 74 | 76 | 74 | 76 | 73 | 74 | 73 | 74 | 75 | 74 |

The Acoustic Correlates of Maria's Vowels

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8 The data of [e] and [o] are taken from Indicates data taken from Hillenbrand et al. (1998).

| Words | | heed | hid | hayed | head | had | hod | hawed | hoed | hood | who'd | hud |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Vowels | | [i] | [ɪ] | [e] | [ɛ] | [æ] | [ɑ] | [ɔ] | [o] | [ʊ] | [u] | [ʌ] |
| GAE | F0 | 235 | 232 | 219 | 223 | 210 | 212 | 216 | 217 | 232 | 231 | 221 |
| Karla | F0 | 193 | 182 | 180 | 161 | 170 | 184 | 192 | 181 | 202 | 205 | 188 |
| GAE | F1 | 310 | 430 | 536 | 610 | 860 | 850 | 590 | 555 | 470 | 370 | 760 |
| Karla | F1 | 399 | 501 | 467 | 577 | 784 | 781 | 627 | 496 | 428 | 446 | 746 |
| GAE | F2 | 2790 | 2480 | 2530 | 2330 | 2050 | 1220 | 920 | 1035 | 1160 | 950 | 1640 |
| Karla | F2 | 2501 | 2375 | 2797 | 2142 | 1646 | 1436 | 1184 | 938 | 1194 | 1230 | 1497 |
| GAE | F3 | 3310 | 3070 | 3047 | 2990 | 2850 | 2810 | 2710 | 2828 | 2680 | 2670 | 2780 |
| Karla | F3 | 3135 | 2887 | 3113 | 2780 | 2530 | 2490 | 2948 | 2935 | 2718 | 2660 | 2481 |
| GAE | DUR | 306 | 237 | 320 | 254 | 332 | 323 | 353 | 326 | 249 | 303 | 226 |
| Karla | DUR | 233 | 176 | 294 | 169 | 222 | 204 | 175 | 281 | 200 | 178 | 137 |
| Karla | Ints | 51 | 52 | 50 | 53 | 53 | 55 | 56 | 55 | 55 | 58 | 57 |

The Acoustic Correlates of Karla's Vowels

| Words | | heed | hid | hayed | head | had | hod | hawed | hoed | hood | who'd | hud |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Vowels | | [i] | [ɪ] | [e] | [ɛ] | [æ] | [ɑ] | [ɔ] | [o] | [ʊ] | [u] | [ʌ] |
| GAE | F0 | 136 | 135 | 129 | 130 | 127 | 124 | 129 | 129 | 137 | 141 | 130 |
| Joel | F0 | 150 | 135 | 153 | 147 | 136 | 142 | 139 | 145 | 145 | 157 | 139 |
| GAE | F1 | 270 | 390 | 476 | 530 | 660 | 730 | 570 | 497 | 440 | 300 | 640 |
| Joel | F1 | 301 | 382 | 373 | 467 | 665 | 537 | 539 | 426 | 407 | 338 | 537 |
| GAE | F2 | 2290 | 1990 | 2089 | 1840 | 1720 | 1090 | 840 | 910 | 1020 | 870 | 1190 |
| Joel | F2 | 2328 | 1822 | 2297 | 1924 | 1921 | 1169 | 1060 | 1054 | 1223 | 1164 | 1164 |
| GAE | F3 | 3010 | 2550 | 2691 | 2480 | 2410 | 2440 | 2410 | 2459 | 2240 | 2240 | 2390 |
| Joel | F3 | 2697 | 2412 | 2766 | 2557 | 2518 | 2384 | 2458 | 2473 | 2553 | 2458 | 2413 |
| GAE | DUR | 243 | 192 | 267 | 189 | 278 | 267 | 283 | 265 | 192 | 237 | 188 |
| Joel | DUR | 345 | 336 | 417 | 300 | 415 | 270 | 289 | 327 | 269 | 351 | 285 |
| Joel | Ints | 80 | 79 | 78 | 78 | 76 | 78 | 81 | 82 | 81 | 83 | 79 |

The Acoustic Correlates of Joel's Vowels