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FLIPPING THE PHONETICS CLASSROOM: A PRACTICAL GUIDE

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INTRODUCTION

Although multiple studies (Derwing, Munro, & Wiebe, 1997; 1998; Gónzalez-Bueno, 1997; Hahn, 2004; Kissling, 2013; Lord, 2005; 2008; Miller, 2012; Sturm, 2013a; 2013b) investigating classroom acquisition of second language (L2) phonology have indicated that learners can improve their pronunciation with instruction and/or practice, Saalfeld's (2011) study revealed no improvement in pronunciation for learners enrolled in a Spanish phonetics course for Spanish stress placement, and subsequent unpublished data analysis revealed that learners did not improve in any category after a semester of instruction. A key finding of Saalfeld (2011) was that students enrolled in the phonetics course exhibited statistically significantly better pronunciation than students in the control group at the outset of the study, indicating that students who would have benefitted most from a phonetics course elected not to take it. Nevertheless, in most phonetic categories, there remained substantial room for improvement by students enrolled in the phonetics course, which raised the following questions: Why did students not make significant gains in their pronunciation? What changes could be made to the course to promote improvement of pronunciation?

As part of a redesign of the math program at the University of Nebraska at Omaha, the university purchased a membership to the National Center for Academic Transformation (NCAT), which included a number of various on-campus workshops on course redesign. In addition, work samples from other course redesign projects were freely available on the NCAT's website. The goal of these redesign projects is to use existing technology to improve learning outcomes, and there are a number of models that can be used to achieve this goal. For the current project, the 'flipped' classroom model described by the NCAT was selected due to its emphasis on classroom practice time. Essentially, a flipped classroom moves part or all of the instructional components outside of regular class time, and class time is spent on student-centered tasks such as discussions, practice, direct application of concepts, and other forms of active learning, rather than on teacher-centered passive activities such as lectures. This seemed appealing for a phonetics course, given the emphasis on practice to improve pronunciation. In this particular flipped model, in addition to time devoted to pronunciation practice in class, there was also time designated each week for students to work on homework assignments during class time so that they could receive help as problems arose.

The main question guiding the implementation of the flipped phonetics course was: What changes needed to be made to promote student learning and improvement of pronunciation? The clear answer was that students needed more practice time. There were two obvious ways to achieve this: first, designate more in-class time for pronunciation practice, and second, assign more recorded homework assignments. However, these

options presented several challenges. In the original iteration of the course, although there was time dedicated to pronunciation practice in nearly every class period, it was impossible to monitor students to ensure that they stayed on task. Given this issue, increased practice time without other modifications to the course delivery format might have had negligible effects. For the recorded homework assignments, the original iteration of the class included a recording every other week. Since this is only one course of three that constitute a typical semester teaching load, adding more recorded assignments needing evaluation would have created an unreasonable amount of work for the instructor. The key question then became: How could additional practice be added to the course without increasing instructor workload?

Implementation

1. Digitize written homework assignments. In the first iteration of the course, there was a bimodal grade distribution on written homework assignments and quizzes, with about half of the class at an A average, and the other half at a low C average. The students in the A-range thought that the course moved far too slowly, and the students in the C-range thought the course moved far too quickly. The C-range students needed more practice with all of the concepts, but the A-range students would have been bored and uncooperative if additional class time had been spent on something that they did not struggle with.

Migrating all of the written assignments to a digital format using the university's course management system (Blackboard) provided a solution to this problem, as it allowed students to repeat the assignments in order to master the concepts presented in class. Students who immediately understood the concepts were able to do the assignment once and move on to the next topic, but students who struggled were able to repeat the assignment and determine where they were having problems on an individual basis. This was a key advantage of digitization. With a traditional model, it would be logistically impossible to allow students to repeat assignments due to the detailed, tedious nature of grading transcriptions.

In order to maximize learning, I implemented the following conditions on the digitized homework assignments.

a. Students were allowed to repeat assignments, but only a limited number of times[1]. Since students weren't able to keep doing the assignment until they figured out the correct answers by chance, they could not simply guess their way to the correct answers without learning.
b. Students could immediately see the answers they submitted for all questions, but they were not able to see the correct answers until after the deadline for an assignment had passed. This prevented them from copying and pasting the correct answers without understanding what they were doing wrong.
c. In the first iteration of the flipped course, I implemented a gated assignment release feature, so that students could only advance to the next homework if they received a grade of 70 or above on the previous one. As a matter of pedagogy and practicality, I discontinued this practice[2]. Pedagogically, it was unnecessary to require students to have mastered one concept prior to moving on to the next one, as they continued to practice that concept, together with a new one, on the next homework assignment.

> Practically, I spent a lot of time making exceptions to deadlines to ensure that students didn't fail the course because of one missing or late homework assignment.

There are a few special considerations necessary for digitized homework assignments in order to maximize student success and minimize frustration with technology.

a. *Give clear directions and a model* (see Figures 1 and 2). This can be easily overlooked when migrating content from a written assignment format to a digital one. With Figure 1 (for all Figures, see Appendix C at the end of the paper), I wanted to encourage productive knowledge of segment descriptions, in which students could produce the description without having a list of options in front of them. Providing specific directions and a model allowed me to use a more active knowledge question format (as opposed to a more passive format such as matching) and still have the question be auto-graded by the course management system. Figure 2 provides an example of an auto-graded paragraph-level transcription question, in which the instructions clearly specify what students need to pay attention to in their transcriptions.
b. *Use matching questions rather than true-false or multiple choice questions* (see Figure 3). If students get a single true-false item wrong, they automatically know the right answer, but they may not know *why* that answer is right and theirs was wrong. For multiple-choice questions, they may be able to guess the right answer without knowing why it's correct, which can be avoided by using a matching question format. In Figure 3, rather than creating 20 multiple choice items asking students to identify the appropriate allophone of /n/, I created a matching question with 20 items and seven answers (the seven allophones of /n/ in Spanish). Students can see their score, but not which individual items they got right or wrong. This way, they're prompted to ask for help on concepts that they don't understand, rather than getting some right answers by guessing, but still not learning anything.

2. Incorporate the use of an acoustic phonetics program into class practice time. To explain the rationale for requiring the use of an acoustic phonetics program, on the second day of class, I played a video of a TED Talk by Dr. Patricia Kuhl (TEDxTalks, 2010; see Appendix A).

The video explains that although humans are born with the ability to perceive sounds in any language, by about 10 months, our brains have learned to ignore sounds that don't occur in our native language(s). Following the video, there was a brief class discussion explaining that because we can't trust our brains to interpret what sounds we hear and produce, we would use an acoustic phonetics computer program that showed pictures of the sounds being produced, so that learners could see the differences in their own productions compared to native speaker productions.

I provided recordings of native speakers, taught learners how to use Praat (Boersma & Weenink, 2013), a free acoustic phonetics program, trained them to analyze various elements of their own speech[3], and taught them how to identify what they needed to do to make their speech more native-like. This strategy made learners responsible for assessing their own pronunciation and figuring out how to improve it, rather than having the instructor as the sole provider of feedback on pronunciation. This approach promoted ongoing learning and improvement, since it teaches learners how to improve their

pronunciation beyond the end of the semester when they don't have access to professor feedback.

3. Increase the number of recorded assignments, but limit grading by selecting only a few to grade over the course of the semester. Although it would be ideal to provide detailed feedback on every assignment, it is not practical and not always a good investment of instructors' time. In order to provide learners with ample practice without burdening the instructor unreasonably, alternate grading procedures can be implemented.

Students were required to submit a recorded assignment on a weekly basis and earned credit based on completion. Additionally, as stated in the syllabus, two assignments per student were graded with detailed comments over the course of the semester, but students had no prior knowledge of which ones would be selected. That method provided sufficient practice opportunities while allowing for detailed feedback and a reasonable workload for the instructor. Students still needed to pay attention to the target sounds in all of the recordings, since they didn't know which were graded. This grading system was adapted from an approach described by a colleague (J. S. Miller, personal communication, November 5, 2013; see Appendix B for a full description).

4. Dedicate the majority of class time to student practice, whether on theoretical material or on pronunciation. In the original implementation of the flipped course, all instruction was delivered outside of class time via videos produced by the instructor using Adobe Presenter. Students indicated that they would have preferred to receive some instruction during the regular class period, so in the next iteration of the course, I provided short explanations of no more than 15 minutes per class (out of a 75-minute class period). The remaining time was devoted to practice of pronunciation and theoretical concepts. The majority of practice activities were converted to an auto-graded digital format so that students could get immediate feedback indicating whether they had understood the concept[4]. During class time, students could not see the correct answers to the practice activities so that they would ask questions during the same class if they did not do well on the practice activities, but the correct answers were made available at the end of each day.

Students were required to complete the homework outside of class time, but there was time designated each week during the class period before the assignment was due for students to ask questions and get clarification about any problems they experienced on the homework. For pronunciation practice, students were required to make recordings in class and use Praat to compare their productions to those of native speakers (provided in the course management system). In order to ensure that students completed the practice activities, I created surveys in the course management system (see Figure 4) that required students to put in information from their recordings, such as formant values for vowels or VOT for stops, for example, and survey completion was part of students' participation grade. This minimized the possibility that students would record themselves without analyzing their own speech production.

5. Schedule the course in a computer lab. The most important element of this course redesign was scheduling the course in a classroom equipped with computers, because the

content for the course was completely digitized and administered through the university's course management system. While most students brought their own laptops to class, not all did. Meeting in a computer lab classroom guaranteed access to the course content during class time.

Special Considerations

There were some challenges and special considerations that complicated the implementation of the flipped phonetics course. In an effort to use resources more efficiently, our campus is currently replacing regular lab computers with virtual clients. This change created a substantial problem during the first iteration of the flipped course, since the virtual clients could not detect analog microphones without having special software installed. Even with special software installed, the virtual clients didn't record sounds at the same level as a traditional machine, so it was necessary to show students how to adjust their audio settings to enable the Microphone Boost feature (and raise the percentage to 100). For this reason, I recommend that instructors inquire ahead of time about what type of computers will be in the lab classroom so that any issues with microphone detection are resolved prior to the beginning of the semester.

One challenge that is likely to occur in Spanish phonetics courses is the growing population of heritage speakers. The heritage speaker population in the current courses consists of active bilinguals whose first language is Spanish, indicating that their phonology is essentially native[5]. Furthermore, research by Au, Knightly, Jun, & Oh (2002), Au, Knightly, Jun, Oh, & Romo (2008), and Knightly, Jun, Oh, & Au (2003) has shown that even childhood overhearers of Spanish enrolled in college-level second-year Spanish courses were able to produce Spanish sounds that were significantly more native-like than those produced by non-native speakers. Therefore, assigning these students recorded homework assignments would create a fundamentally unequal grading scheme, because they would automatically receive a perfect score for 30% of the final course grade by virtue of being heritage speakers. (In this course, 30% of the final course grade was based on digital homework assignments, 30% was based on quizzes, 30% was based on recorded assignments, and 10% was based on class participation.) Equally problematically, this requirement has no benefit for heritage learners, since it is not designed to address their linguistic needs. However, eliminating the recorded homework component for heritage speakers and weighting digital homework assignments and quizzes at 45% each would result in a substantially more difficult course than the 30/30/30/10 weighting, which would be unfair to heritage speakers, both for reasons of relative course difficulty, as well as because it fails to address their specific linguistic needs. There are two possible solutions to this issue. Since one of the main course objectives is improvement of pronunciation, it may make sense to restrict enrollment to only L2 learners. Alternately, it is possible to provide differentiated instruction for both learner populations[6]. For homework assignments, this would involve providing homework assignments of equivalent difficulty focusing on the linguistic needs of heritage language learners as an alternative to the recorded homework assignments. One known issue for heritage Spanish learners is that orthography tends to be challenging, given that a number of sounds are represented by more than one letter[7]. This could be addressed by providing recordings of speakers of dialects that make a phonemic

distinction between the sounds represented by different letters, and asking learners to indicate which word they heard[8]. The larger problem for differentiated instruction is the in-class time dedicated to pronunciation practice. This would require creating separate sets of in-class activities for both learner populations in order to ensure that both benefit from the course. One suggestion for this type of in-class activity would be to have heritage language learners compare recordings of their own speech with that of a speaker of a different dialect of Spanish (I. Velásquez, personal communication, November 18, 2013)[9].

One area that requires further revision is in-class pronunciation practice. Because the assignments were not graded, a number of students treated them as optional, and elected to do other work during the designated pronunciation practice time. Although these students received repeated reminders and lower participation grades when they engaged in this behavior, this was not an effective deterrent. One possible solution is to create graded in-class pronunciation assignments marked as complete or incomplete to ensure that all learners practice pronunciation during the allotted class time.

CONCLUSIONS

The flipped classroom is a valuable model of instruction in phonetics for various reasons. In particular, the ability to repeat homework assignments means that it is possible to implement differentiated instruction in an efficient way. In addition, teaching learners how to evaluate their own pronunciation promotes learner autonomy and ongoing improvement even after the semester has ended. While this model has not led to a 100% student success rate, it has allowed students who would normally struggle and possibly fail the course to get the help and repetition they need in a timely fashion so that they can be successful in the course, both in terms of theory and practice.

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Notes

[1]Students were allowed to repeat an assignment a maximum of five times for the most detailed assignments. The initial homework assignment was the least detailed, and students were allowed to submit it twice. As the content became more detailed, the number of attempts allowed gradually increased to a maximum of five.
[2]I continue to use this gated assignment release structure in an Introduction to Linguistics course, where it is essential that students understand each concept in order to understand the next one.
[3]Some examples include measuring VOT values for voiceless stops, formant values for vowels, noting differences between voiced stops and approximants in a spectrogram, and noting differences between English /ɹ/ and Spanish /ɾ/ and /r/ in a spectrogram.
[4]These practice activities did not count towards learners' course grades; they simply were administered digitally so that learners could repeat them and get immediate feedback.
[5]Although research by Flege (1987) shows that the addition of a second language can affect L1 pronunciation even in late bilinguals, so that it is not equivalent to that of a monolingual native speaker, these differences are detectable only by taking fine-grained acoustic measurements.
[6]As Carreira (2012) notes, it is crucial to differentiate instruction, whether in a heterogenous heritage language (HL) course, or a course made up of heritage language speakers and non-native speakers:

> "Among the most pressing diversity issues surrounding HL teaching are those concerning fairness and accessibility. Given that HL learners with differing proficiency levels are funneled into the same HL class by virtue of constraints on course availability, is it fair and realistic to expect the same of all students in the class? Doesn't this placement outcome virtually doom the less proficient learners to low grades and guarantee high grades to the more proficient learners?
>
> Concerns of this nature often focus on the less proficient learners, since they are the most at risk of failure, both in terms of grade and desertion/truancy. However, there's also cause for concern regarding more proficient learners, as they may be assigned to classes that have little to offer them in the way of new and challenging material. Though these students may end with a good grade, they may be unmotivated to continue their study of Spanish" (p. 102).

[7]The phoneme /s/ is represented with "s", "z" and "ce"/"ci" in all dialects of Latin American Spanish, for example, and /ʝ/ is represented by both "y" and "ll" in most dialects of Spanish.
[8]There are a number of words in Spanish that are homophonous in most dialects of Spanish, but are minimal pairs in a select few. Although "casa" ('house') and "caza" ('hunt' 3rd person singular present indicative) are both pronounced /ˈka.sa/ in all dialects of Latin American Spanish, in Castilian Spanish, the letters "z" and "ce"/"ci" are pronounced /θ/,

and “s” is pronounced /s/, so that “casa” is /ˈka.sa/, and “caza” is /ˈka.θa/. Likewise, although “calló” (‘shut up’ 3rd person singular preterit indicative) and “cayó” (‘fall’ 3rd person singular preterit indicative) are homophonous in most dialects of Spanish, in Andean Spanish, the sequence “ll” is pronounced /ʎ/, while “y” is pronounced /ʝ/, so that “calló” is pronounced /ka. ˈʎo/, and “cayó” is pronounced /ka.ˈʝo/.

[9]Heritage Spanish learners also experience difficulty with placement of accent marks (and connecting spoken word forms to written word forms when multiple prosodic accent patterns are possible), so another possible activity for both in-class and homework assignments could be to provide recordings of minimal pairs or triplets differing only in stress placement and ask them to select the word that they heard. For example, a recording could provide the word ‘calculó’ (/kal.ku.ˈlo/), and learners would need to choose from a set of three words: cálculo (/ˈkal.ku.lo/), calculo (/kal.ˈku.lo/) and calculó (/kal.ku.ˈlo/). These activities, while not strictly related to phonetics and phonology, make use of main concepts discussed in phonetics and phonology (prosodic accent patterns, dialectal variation) to provide instruction specifically designed for heritage language learners.

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Appendix A
Links to resources

1. http://www.thencat.org/. The National Center for Academic Transformation.
2. http://rishida.net/scripts/pickers/ipa/. IPA character picker.
3. http://ipa.typeit.org/. IPA character picker.
4. http://portfolio.anitasaalfeld.com/samples/blackboard. Additional screen shots of digitized assignments.
5. http://www.youtube.com/watch?v=qRRiWg6wYXw. Dr. Patricia Kuhl's TED Talk on child language acquisition.

Appendix B

Modified pronunciation homework scheme for a flipped phonetics course
(J. S. Miller, personal communication, November 5, 2013)

The grading scheme described in the current article was adapted from one used by Jessica Miller (University of Wisconsin-Eau Claire) in a French phonetics course. In that course, students submitted weekly recorded homework assignments, and the instructor graded one-third of them each week. Miller used an Excel spreadsheet to assign each student a random number, and then sorted them from smallest to largest and divided them into three groups. She then graded one-third of the homework assignments each week during three-week periods, but did not post grades until each three-week period had ended. This way, students did not know whether their assignments were graded during any given week, so that the students whose assignments were graded in the first week would still submit the assignments for the second and third weeks.

Miller has since adapted a completely new assignment structure as a result of flipping her French phonetics classroom. Due to the new instructional model, she has freed up approximately 40 minutes of class time per week for pronunciation practice. This time is used each Friday for conversations. Miller moves from group to group and randomly grades half the class (seven or eight students, in this case) according to rubrics that she has created that evaluate what students should be producing at that point in the semester. She estimates that she spends about 4-5 minutes with each student, giving in-person feedback and direction for resolving pronunciation problems. Students are required to switch partners every week for the conversation time. Miller notes that under this model, students receive five pronunciation grades over the course of the semester, with immediate oral feedback, and that she no longer has to grade oral recordings, which has substantially reduced her grading time.

In addition to the in-class changes, students in Miller's class are required to participate in an hour-long conversation outside of class every other week, and watch a movie every other week. Each Friday when they take a quiz, students turn in a reflection paper prepared at home on either the movie or the conversation (with specific questions related to the lessons and to their own learning), which is part of their quiz grade.

Miller has noted an improvement in students' spontaneous speech production, and that students seem more engaged because the conversation task is more authentic than a recorded homework assignment. Additionally her grading time has been reduced to about an hour and a half per week.

Appendix C - Figures

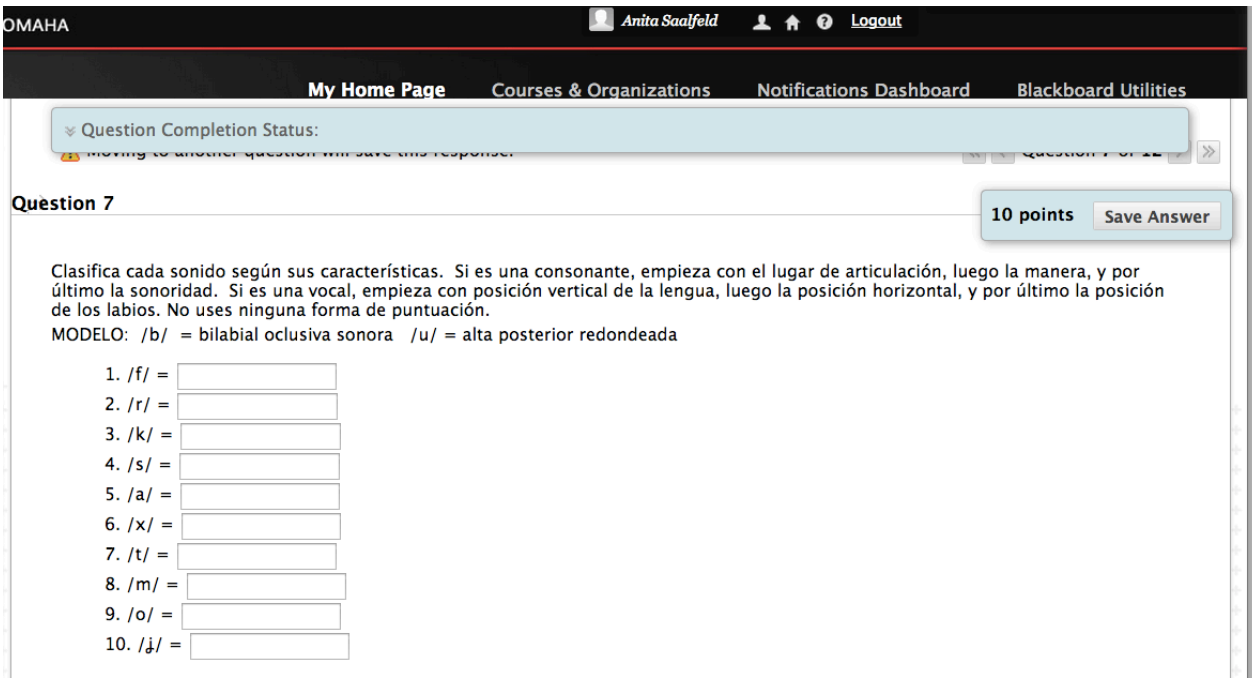

Figure 1. Clear directions and a model. Students were asked to provide a description of the articulation of each segment, using a fill-in-the-blank question type to promote active knowledge.

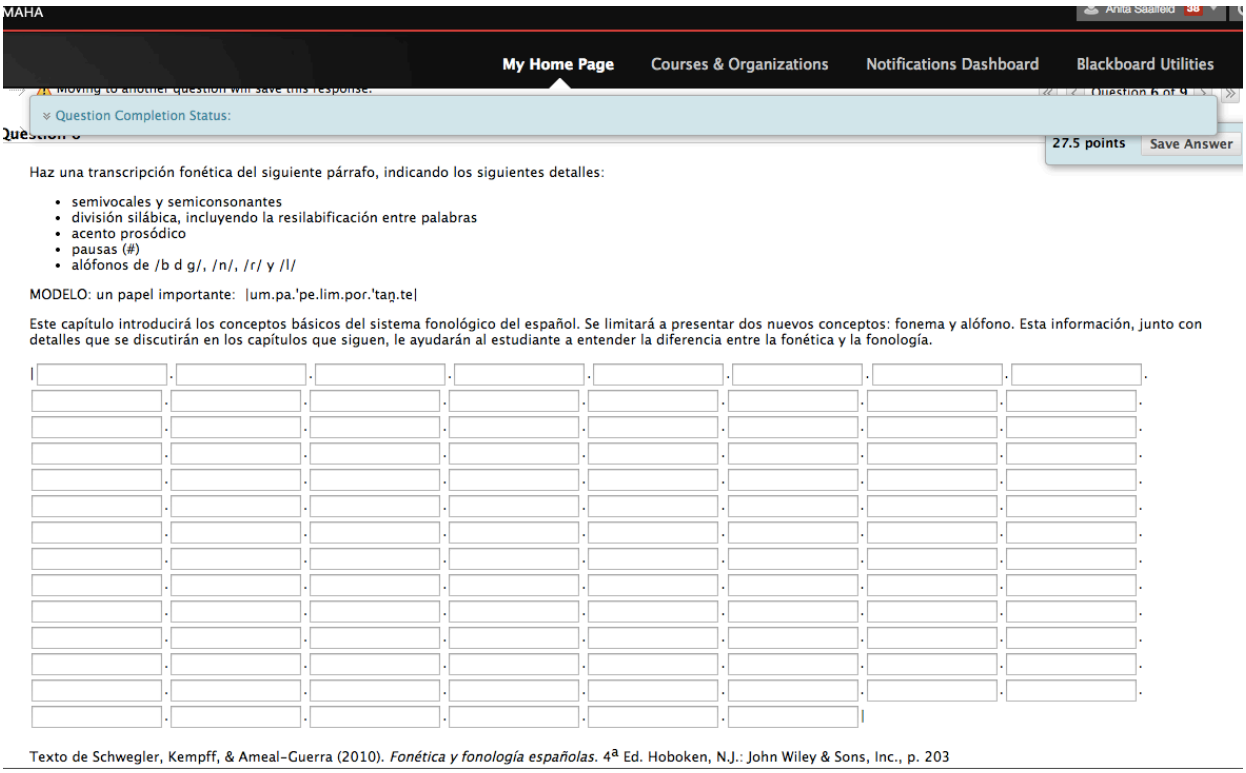

Figure 2. Auto-graded paragraph-level phonetic transcription. Students entered phonetic symbols using an online phonetic character picker (see Appendix A for two options).

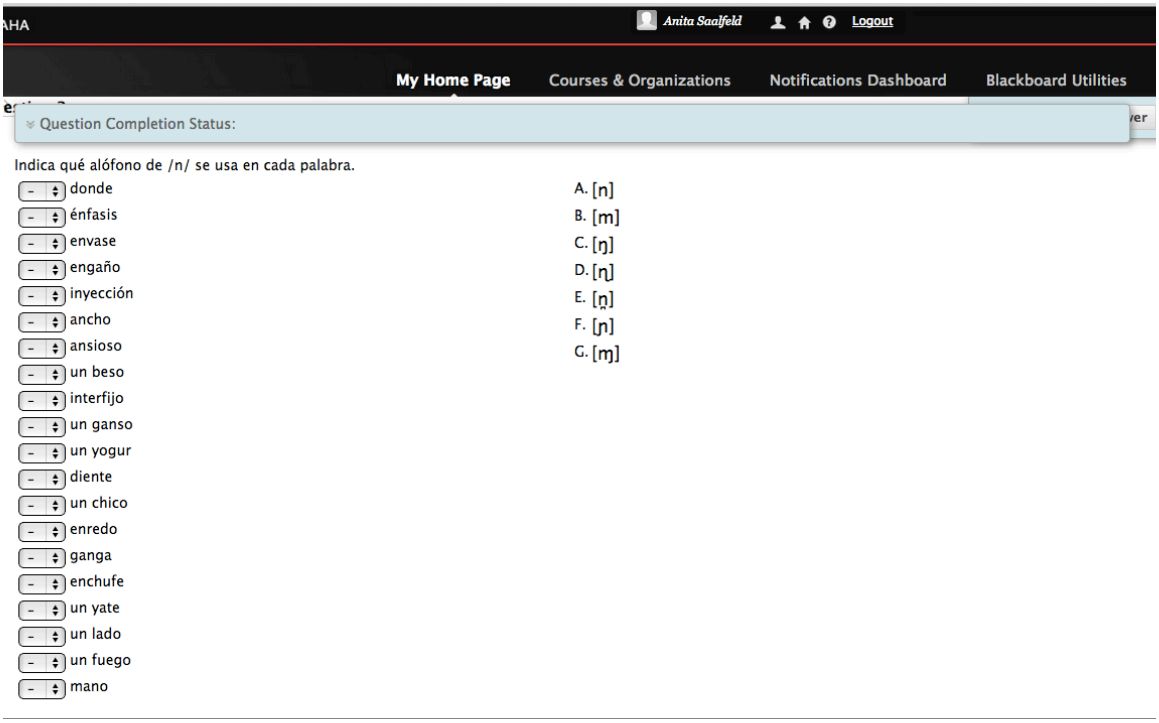

Figure 3. Matching question for allophones of /n/. Using a matching question rather than a multiple-choice or true-false question helps to make learners more aware of areas in which they need help.

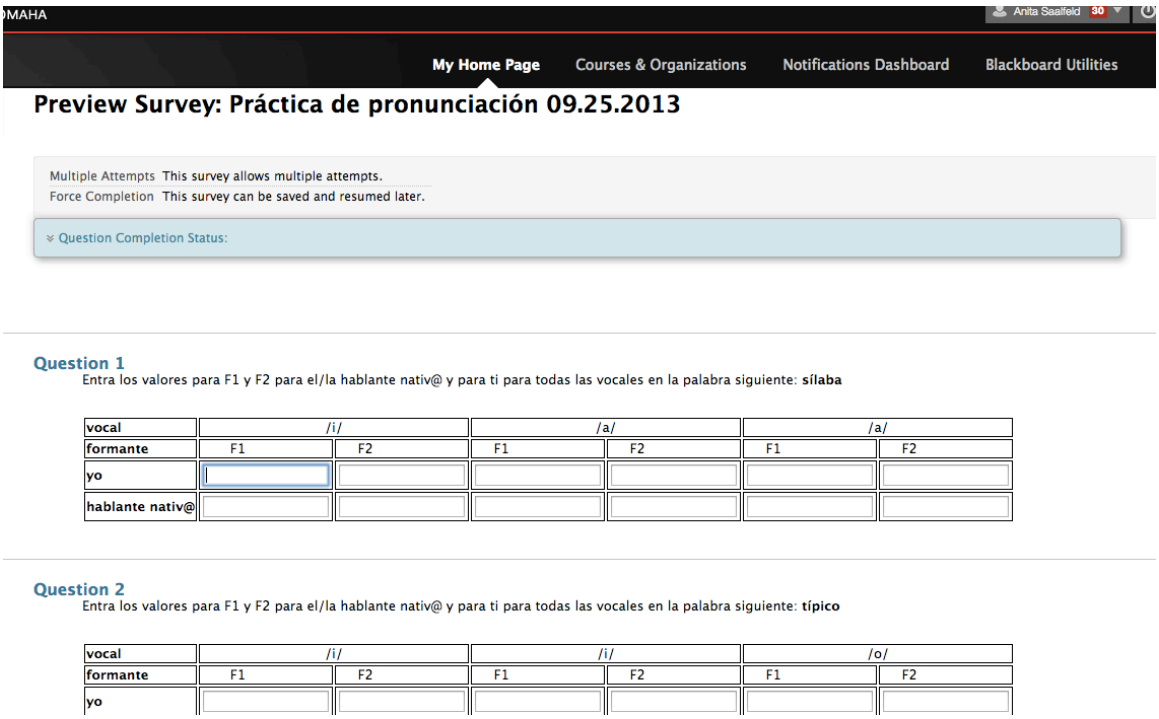

Figure 4. Pronunciation activity. This exercise required students to enter F1 and F2 values for both their own and native speaker productions of given words.