

SUPPORTING EFL LEARNERS WITH A VIRTUAL ENVIRONMENT: A FOCUS ON L2 PRONUNCIATION

Jacqueline Aiello
Anna Mongibello

Università degli Studi di Napoli "L'Orientale", Italy

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The article discusses a pilot project that explored the implementation of a virtual environment for the improvement of English pronunciation, funded by the Italian Ministry of Education, University and Research (MIUR) as part of a wider e-learning program for Higher Education. A speech recognition software program, *SpeechAce*, was embedded within the e-learning course to provide live practice and feedback on pronunciation to 372 undergraduate students at the University of Naples "L'Orientale" in 2016-2017. The project team was composed by Professors of English Oriana Palusci and Katherine E. Russo, who designed and coordinated the project, and e-tutors Jacqueline Aiello and Anna Mongibello, who generated the online course on Moodle and monitored students' activities. The virtual class was created to foster awareness of English sounds and to practice pronunciation, an area that is often neglected in the Italian education system due to the large number of enrolled students. This paper first describes the project in depth and draws

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on the quantitative analysis of the students' performance in combination with authentic online listening input. Then, data collected in pre- and post-program questionnaires are analyzed to examine the impact of participation in the online project on self-perceived pronunciation proficiency and L2 self-confidence, and to unveil participants' opinions and experiences in this virtual environment.

1 Introduction

Pronunciation plays a significant role in spoken interaction and is directly connected with language proficiency and students' self-confidence. Nonetheless, pronunciation teaching is often neglected in English language teaching (ELT), being treated as a "low priority area of study" (Derwing and Munro, 2005, p. 382). Harmer (2001) maintains that while the vast majority of English language teachers "get students to study grammar and vocabulary, practice functional dialogues, take part in productive skill activities and become competent in listening and reading," these teachers "make little attempt to teach pronunciation in any overt way and only give attention to it in passing" (p. 183). This is because English as a foreign language (EFL) assessment and evaluation mainly rely on written exams. Research has showed that the more the learners' oral skills improve, the more self-confident they become, especially in social interactions within and outside the classroom (e.g., Celce-Murcia, 1987). As a matter of fact, pronunciation is the one aspect that can cause communication breakdowns in social interactions and creates the most anxiety to EFL learners (Dewaele, 2007; Dewaele, Petrides & Furnham, 2008). Given that the success of "spoken communication is grounded on the communicability not only determined by correct grammar and profuse vocabulary but also on the correct interplay between segmental and suprasegmental features making up pronunciation" (Marzà, 2014, p. 262), on the basis of 'bad pronunciation' and accented speech, students may be discriminated or stigmatized (Busà, 2008; Lippi-Green, 2012; Moyer, 2013). Limited pronunciation skills can therefore affect learners' self-confidence (Pourhosein, 2012; Donovan & MacIntyre, 2004). On the other hand, since accents are closely linked to personal and group identity, EFL learners may resist sounding like native speakers (Jenkins, 2009; Russo, 2014). Thus, while "different elements of language are learnt with varied success [...], pronunciation appears to be the most problematic area" (Szpyra, 2015, p. 5). This is one of the primary motivations that compelled us to concentrate on this aspect of language learning in the e-learning course we offered to EFL learners at the University of Naples "L'Orientale" (UNIOR).

2 The pilot project at UNIOR

2.1 Course design

The course, funded by the Italian Ministry of Education, University and Research (MIUR) and part of UNIOR's *Progetto di Formazione a Distanza*, a wider e-learning program for Higher Education coordinated by Prof. Giorgio Banti, was developed on the *e-learning L'Orientale* Moodle platform. It was divided into six units leading through the exploration of some main features of English pronunciation (consonant and vowel sounds, rhythm, intonation and stress, etc.). One of the objectives was to make the participants aware of different varieties of English used around the globe. We also wanted to show how cultural appropriations can affect pronunciation, which ultimately leads to language contact questioning the hegemony of British and American standard forms, and to new standard varieties whose compounded names (South African English, Indian English, Canadian English, for instance) “display the non-British nation as first stem, thus recognizing status to an older linguistic tradition still resisting full assimilation” (Palusci, 2010, p. 10).

Every unit consisted of two parts: a theoretical one which included videos, explanations and examples, and a practical one, made of exercises designed by the e-tutors, exercises using *SpeechAce* along with forums that prompted students to reflect on the course content, sharing their experiences and opinions. In addition to the units, an introductory section and a welcome message were also offered in order to explain the general objectives of the course. Students could expect to *discover* which features of English pronunciation they needed to work on the most in order to communicate more intelligibly; *improve* their ability to understand conversations in English, and *learn* strategies for practicing pronunciation on their own. At the beginning and at the end of the course, students were asked to complete pre- and post-program questionnaires that will be discussed in detail in the next sections.

The length of the course varied. Initially, the students were given three months with single units available only for 12 days each. This was decided in order to guide students through a progressive path, focusing on one unit and one aspect of English pronunciation at a time. Nonetheless, feedback highlighted that most of the participants who dropped out could not handle the 12-day deadline per unit. For this reason, starting with the group enrolled in November 2016, we decided to leave the practical sessions open for one entire month, so that the students did not have to face multiple deadlines and could progress at their own pace.

What is this? Why am I here?

Before we get started...

...please take some time to introduce yourself on the [Forum](#) and read the information about the content of this online course.



English has played a pivotal role in globalization, migration and the formation of the European Union. It is estimated that over one in four of the world's population - or 1.5 billion people - use English as a first, second or foreign language. The widespread use of English has transformed the language into a transnational lingua franca.

Step 2: WATCH

Any idea of what Global English means? Watch this video where famous Professor David Crystal explains why English is a global language.



Fig. 1 - Screenshots of the online course

2.2 Participants

Four hundred and fifty students signed up for the course. However, only three hundred and seventy-two completed all the activities. The students were divided into three groups: the first group obtained access to the online course in March 2016, the second in November 2016 and the third in June 2017, after the project was refinanced in March 2017. The groups were composed by a majority of females (80%), whose ages ranged from 20 to 29 and averaged at 20.10, as the pre-course questionnaire showed. All students were in their third year of university, enrolled in the Linguistic and Cultural Mediation program, a bachelor degree program where English language knowledge is assessed through three written and oral English language exams, one per year. Students are generally granted 144 hours of English teaching classroom per academic year in order to prepare for their annual English Language exam. The online pronunciation project was meant to present the students with additional non mandatory hours of practice and a specific path to improve their oral skills. Only in March 2016 and partly in June 2017, the online course overlapped with in class teaching hours, which may explain why a percentage of students (18.6 and 26.7, respectively) dropped out during both of these turns.

2.3 Voice-recognition software

In recent years much attention has been devoted to Web 2.0-based technologies as teaching tools for language learning in virtual environments meant to tailor learning activities and trigger students' participation. Broadly, it has been found that the use of computer technologies play an important role in the development of both interest and competence (Barron, 2003). Among the many computer-based applications, automated speech recognition technology is proving to be a powerful tool for the improvement of students' abilities in

the field of EFL teaching and learning. However, while numerous experiences relying on the potential of e-learning and blended learning in general have been investigated and documented (Blessinger & Wankel, 2008; Garrison & Vaughans, 2008), very few experiments have examined the effectiveness of voice recognition technologies (Poulsen *et al.*, 2007), especially as an instructional tool integrated in language learning software programs for EFL students at a university level. Based on our research, none embedded voice recognition software programs on Moodle, the most used Learning Management System at higher education levels. A thorough investigation of the available technology for Moodle led to *SpeechAce*, a speech recognition system that can be added to any Learning Tools Interoperability compliant learning system. *SpeechAce* provides syllable and phoneme level feedback to students' oral performance. The software procedure entails that students record samples of their audio in response to pronunciation exercises. These audio recordings are then automatically processed by the system, generating an output that illustrates to users the location of the mistake, if present. The software was set on Standard American English.

Pronunciation exercises were created in accordance with each unit's main focus. In Unit 1, for example, students were asked to practice with particularly challenging sounds such as syllabic consonants, consonant clusters and the difference between voiced and unvoiced consonant sounds. Figure 2 shows an example of an exercise testing the correct pronunciation of the voiced consonant sound /dʒ/ set on the software's standards: the students had to record their voice while pronouncing the word "ingenuity" and then verify their spoken output. An "expert audio" file could also be played as a guide track. After processing the results, the software provided a "checked response chart" that allowed the students to see how they performed in pronouncing each syllable. The chart also provided a feedback on the position of lexical stress along with a short automatic message clarifying the level achieved.

A total of 49 sets of word- and sentence-level pronunciation activities, each containing an average of 10 exercises, were generated using speech recognition technology. Every exercise included a native speaker audio file model and a phonetic transcription. An additional 20 exercises were designed using the Moodle timed quiz tool and were meant to assess students' acquired knowledge about English pronunciation features; and seven forum discussions – one for each unit and an initial one where students were asked to introduce themselves – invited students' input and were monitored by the e-tutors. Students completed 84% of the exercises, spending on average 18 minutes on each and generating 8100 speech recognition requests.¹

The students received an average quality percentage for each attempt, then

¹ Data provided by the *SpeechAce* developers team.

translated by Moodle into scores from 0 to 10. Students were scored according to the percentage of accuracy of their attempts. One full point was given for each exercise upon the achievement of a percentage of accuracy up to 100%. Therefore, for each exercise, poor performances (0 to 30% accuracy) were scored from 0.00 to 0.30; medium performances (30 to 50% accuracy) from 0.30 to 0.50, medium-high from 0.50 to 0.70 (50 to 70% accuracy) and very successful performances from 0.70 to one full point (70 to 100% accuracy). Exercises could be repeated more than once.

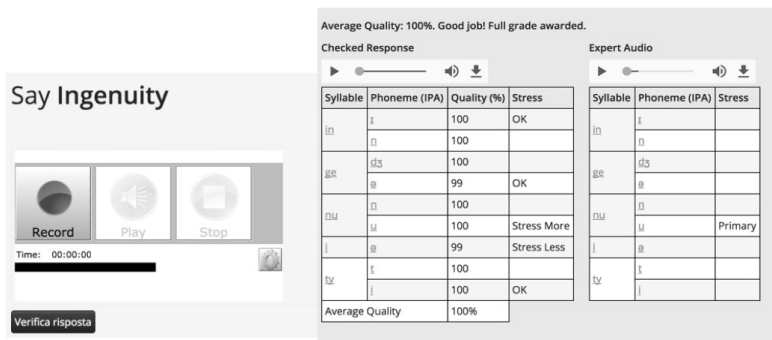


Fig. 2 - Example of exercise created using *SpeechAce*

2.4 Students' performance

As seen in the pie chart in Figure 3, 60% of the activities registered medium-high performances, translating into 31 exercise sets out of 49 which were completed with final medium-high scores. More specifically, 79% of the participants obtained between 0.50 and 0.70 points per exercise question, while the remaining percentage oscillated between 0.30 and 0.50, in some cases even lowering to 0.20. There were 13 activities, though, that saw a slight decline in students' performance: if we refer to the pie chart, we can see that these correspond to the 29% of the course registering much lower rates, with students being scored between 0.00 and 0.30 per exercise question. It was noticed that the exercises that created more troubles were the ones testing key vocabulary, minimal pairs, and full sentence pronunciation. For instance, an average 20% of the students showed difficulties in articulating phonemes in words such as “journalist”, “discounted”, “capacity”, especially with regard to vowel sounds, consonant sounds and diphthongs that do not have equivalents in Italian. The feedback received from *SpeechAce* highlighted problems in differentiating /ɪ/ from /i:/, as in “introvert” or “attributes”, and in realizing /ʌ/ in minimal pair exercises (“cap” and “cup”, for instance), which registered lower percentages

of accuracy. There were also issues related to the contrast between /s/ and /z/ as in voicing the difference between “advice” and “advise” in minimal pair sets of exercises.

Another area where difficulties arose is that of rhythm, stress and intonation. In particular, data retrieved from performances relating to the sets of exercises that tested the pronunciation of sentences revealed a generalized problem in addressing stress at the syllabic level in activities where students were asked to voice full sentences. About 26% of the students failed to reproduce the right stress in sentences such as “Wild salmon was his absolute favorite” or “Mohammed was listening to hours and hours of lectures on brain plasticity”, and 10% of participants obtained between 7 and 0 points total in sets of this kind (which included 10 questions per set), making an average of 6 attempts before giving up.

Aggregate Outcomes in *SpeechAce* Exercises

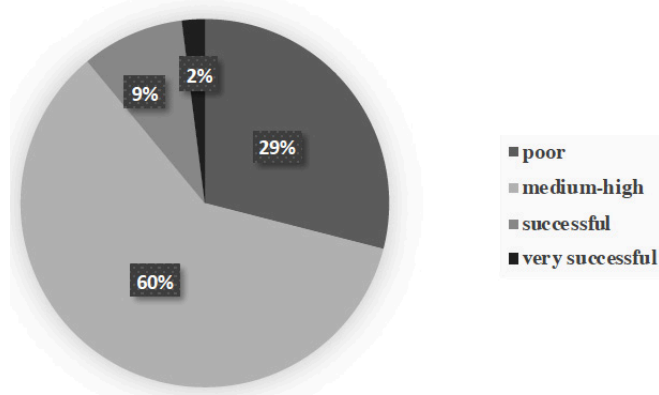


Fig. 3 - Pie chart showing students' performance in sets of exercises

Overall, as the pie chart shows, the students managed to maintain medium-high standards in 60% of the exercises. They performed better in 9% of the activities, rated as “successful performances” in the chart, being scored between 0.70 and 0.80 per question. Finally, in 2% of the course activities they did even better, getting an average of one full point per exercise question.

3. Pre- and Post-Program Questionnaires

3.1 Questionnaire Data Overview

Students who enrolled in the online course completed a pre-program questionnaire at the start and a post-program questionnaire at the end of the project. The questionnaires asked for participants' background information,

attitudes towards pronunciation, self-perceived assessments of pronunciation skills and confidence levels (for which items were adapted from the questionnaire in Russo, 2014), and opinions on the project (post-program only). In this paper, we draw on questionnaire data to investigate the following research questions:

1. What are participants' views concerning (their) English pronunciation and its instruction?
2. Were there differences in participants' self-perceived ratings of their pronunciation skills and confidence levels in pre- and post-program questionnaires?
3. What were the participants' experiences and opinions about the course?

This section analyzes data collected in the first round of the project, which began in March and ended in May 2016, from a subset of 108 participants who submitted both pre- and post-program questionnaires. The average age of this subsample was 22.15 years and 85.2% were females while 14.8% were males. Quantitative data were analyzed using descriptive statistics and paired-samples t-tests for pre-post program comparison using SPSS version 23. For open-ended responses, the concordance program *AntConc* was used to assemble word frequencies, and thematic and content analysis were used to code open-ended responses and identify common themes and patterns.

3.2 Pronunciation

Pre-program questionnaires prompted participants to indicate how much they agreed with a series of statements concerning pronunciation in English.

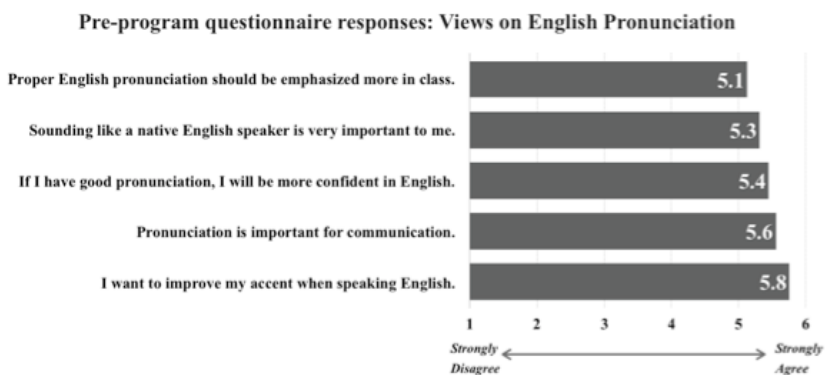


Fig. 4 - Bar graph illustrating pre-program questionnaire responses to items about English pronunciation

As illustrated in the bar graph, on average, participants most strongly agreed that they wanted to improve their English accent and that pronunciation was important for communication. Additionally, participants linked ‘good’ pronunciation to confidence, and they believed that sounding like a native English speaker was important to them. They also agreed, overall, that more emphasis should be placed on pronunciation in their English class. As a whole, these responses, which depict L2 pronunciation as a significant aspect of L2 learning, suggest why students joined and actively participated in the virtual environment.

3.3 Self-Perceived Proficiency and Confidence

Questionnaires gathered data on participants’ self-perceived ability in English pronunciation skills with questions that prompted participants to rate: their overall pronunciation in English; their pronunciation of English vowels; and their pronunciation of English consonants. To answer research question 2 and to determine whether there were differences in participants’ self-perceived assessments of pronunciation skills at the start and at the end of the project, paired samples t-tests were conducted for pre- and post-program questionnaire responses. Figure 5 shows that there were statistically significant increases from pre- to post-program ratings for participants’ overall English pronunciation (Pair 1: $t(106) = -11.983, p < .001$), English vowel pronunciation (Pair 2: $t(105) = -12.534, p < .001$), and English consonant pronunciation (Pair 3: $t(106) = -11.332, p < .001$). These findings suggest that participants assessed their English pronunciation skills more favorably after having participated in the project.

		Mean		SD		95% CI of the Difference			t	df	Sig. (2-tailed)
		pre	post	pre	post	Lower	Upper				
Pair 1	How would you rate your pronunciation in English? ¹	3.69	4.71	0.83	0.66	-1.02	-1.19	-0.85	-11.983	106	0.000
Pair 2	How would you rate your pronunciation of English vowels?	3.40	4.57	0.98	0.76	-1.17	-1.35	-0.98	-12.534	105	0.000
Pair 3	How would you rate your pronunciation of English consonants?	3.77	4.73	0.85	0.76	-0.96	-1.13	-0.79	-11.332	106	0.000
¹ Scale: 1 = Very Poor; 2 = Poor; 3 = Fair; 4 = Good; 5 = Very Good; 6 = Excellent											
Pair 4	I feel that I currently have excellent pronunciation skills in English. ²	3.33	4.03	1.14	1.00	-0.70	-0.91	-0.49	-6.501	105	0.000
² Scale: 1 = Strongly Disagree; 2 = Disagree; 3 = Slightly Disagree; 4 = Slightly Agree; 5 = Agree; 6 = Strongly											
Pair 5	I feel quite sure of myself when I speak in my English class. ³	3.66	4.47	1.18	0.97	-0.81	-1.00	-0.63	-8.64	105	0.000
³ Scale: 1 = Never; 2 = Hardly Ever; 3 = Rarely; 4 = Sometimes; 5 = Often; 6 = Always											

Fig. 5 - Paired Sample t-tests: self-perceived pronunciation ability ratings (mean) and L2 self-confidence levels (mean) in pre- and post-program questionnaires.

Analyses of responses to items that related to self-confidence in English also revealed statistically significant pre-post changes. Students more strongly agreed that they had excellent pronunciation skills in English (Pair 4: $t(105) = -6.501$, $p < .001$) at the end of the project than at the start of the project. A comparison of pre-post questionnaire responses also suggests that participants more frequently felt sure of themselves when speaking in their English classes (Pair 5: $t(105) = -8.636$, $p < .001$) at the end of the project. Therefore, in addition to an increase in self-perceived pronunciation abilities, participants also expressed a greater degree of L2 self-confidence in post-program questionnaires.

3.4 Opinions and Experiences

Research question 3 aimed to gauge participants' responses and experiences in the online pronunciation project. To address this question, the post-program questionnaire included targeted questions that prompted participants to write open-ended responses about their favorite aspect of the course and to indicate whether and why they would recommend the experience to a peer. The greatest proportion of students listed *SpeechAce* as their favorite part, based on their appreciation of the native speaker model and accompanying phonetic transcription, and they most preferred the unit dedicated to vowels, followed by the unit on World Englishes. Participants also noted that they improved and experienced increased awareness of their pronunciation. They enjoyed that the project – and particularly the voice recognition system – provided them with immediate feedback on their pronunciation.

Of the 106 participants who provided responses, all but one indicated that they would recommend the project to peers (99%). Frequency analysis of open-ended responses to a prompt that invited students to explain why (or why not) they would recommend the course unveiled that the most frequently used verb after “recommend” (47 occurrences) was “improve” (44 occurrences), and the most frequently used adjectives were “useful” (21 occurrences), “good” (14 occurrences) and “important” (14 occurrences). The undeniably positive connotation associated with these most frequently used terms further indicates the positive attitudes that participants had about the e-learning project.

In questionnaires, students were also asked for their suggestions on how to change and improve the project in an open-ended prompt. In response, roughly 40% of participants said nothing should be changed. Problems that participants had with the *SpeechAce* software, including redundant exercises, audio glitches, and lagging speed, amounted to roughly 40% of the total. In particular, participants hoped that future iterations of the project could decrease exercise redundancy (16%), address audio issues (13%), and increase uploading speed (7%) within the *SpeechAce* component of the online course. Participants

also expressed a preference for sentence-level pronunciation activities and therefore wanted fewer word-level activities (6%), and a small proportion suggested that the project cover a wider range of English varieties (5%) and include more videos (4%) in the future. The remaining 12% had miscellaneous responses categorized as ‘other’.

Conclusion

As exhibited by participant responses when asked about their views on pronunciation, the language learners in this study attached great importance to English pronunciation and valued instruction dedicated to pronunciation. Still, providing immediate, individualized feedback on oral language production remains an arduous task in many language learning settings with disproportionately high enrollment and large class sizes. This problem is particularly salient with English language instruction, which is increasingly in demand as the language secures its role as an international lingua franca in myriad domains. The e-learning project presented in this paper was designed with this issue in mind.

Indeed, as a whole, the e-learning project was designed to hone in on and sharpen the oral English production skills of English majors in their last year of undergraduate studies at an Italian university. By means of exercises using voice recognition software with native speaker oral guides, tutor-crafted activities, related videos and reflective forum prompts, the virtual environment granted participants the opportunity to gain awareness and practice the sounds of the English language. As participants in the online course, university-level students had a portable, accessible, learner-tailored domain in which they could exercise their L2 production, far from the anxiety-inducing scrutiny of instructors or peers, and with full autonomy.

The comparison of the pre- and post-program responses to participants’ ratings of their ability to pronounce English vowels and consonants in particular, and their English pronunciation overall, revealed that participants gave themselves statistically significantly higher ratings after participating in the project. They also exhibited statistically significantly higher L2 self-confidence at the end of the project. Although these findings should be interpreted with caution because of the lack of a control group in this study, participants shared in open-ended responses that they felt that their linguistic competence developed and improved as a result of the course, which corroborates the increase in self-perceived pronunciation proficiency. This finding is particularly compelling because self-perceived proficiency holds great explanatory value. Not only has prior research suggested that subjective self-perceptions of language competence correlate to objective measures (e.g. Kang & Kim, 2012), but it

has also uncovered that self-perceived competence is an underlying component of willingness to communicate. As explained in Clément, Baker and MacIntyre (2003), while actual competence might influence communication, “it is the perception of competence that will ultimately determine the choice of whether to communicate” (192; See also Dilbeck *et al.*, 2009; MacIntyre *et al.*, 2002). In light of the connection among these critical constructs, an increase in self-perceived proficiency and L2 self-confidence can enhance the likelihood that participants will engage in interactions in English, thereby exposing them to L2 input and strengthening L2 output production. As a result, the virtual learning environment can have positive implications on the language learning trajectories of these participants. However, to address a limitation of our study, future research that explores the perceived outcomes of the implementation of voice recognition within online environments should include a control group. Another interesting future research direction may entail exploring pre-post changes not only in perceived but also in actual student outcomes.

In addition to an increased sense of competence and confidence in the L2, participants shared positive opinions and attitudes towards the e-learning course. They indicated that they enjoyed the project, they found various foci and aspects useful for their pronunciation development, and particularly appreciated access to immediate feedback on their oral English performance. When asked what they would change about the project, students who offered suggestions stated that the voice recognition software could benefit from some enhancements. Consequently, future research should zero in on ways of improving existing technology.

In conclusion, we found that, overall, this project was easy to implement, generated a wide array of student data, and was well received by students who felt more competent after having participated in the project. Our experience and findings suggest that voice recognition technology embedded within a virtual environment designed to foster reflection on and awareness of English sounds can be an asset in EFL learning. Specifically, this course can help in providing each student in large classes timely, targeted feedback and the support that EFL learners need to develop communicative competence and L2 self-confidence.

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