Using Google Docs Mobile Application for Autonomous Pronunciation Practice in a Japanese University EFL Program

Becky L. Sanchez[1*], Shady Elkassas[2]

[1] Tokyo International University, Japan
[2] University of South Carolina, USA
[*]Corresponding author's email: becky.sanchez411@gmail.com
[*] https://orcid.org/0009-0006-3789-2761
https://doi.org/10.54855/callej.2526111

Received: 05/11/2023 Revision: 10/02/2025 Accepted: 21/02/2025 Online: 01/07/2025

ABSTRACT

This study investigates the use of the Google Docs mobile app to improve students' pronunciation and explores potential effects on their autonomy, self-efficacy beliefs, and motivation for pronunciation practice. The participants were 71 Japanese university freshmen enrolled in a compulsory Basic Speaking class for a 16-week semester. Pre- and post-surveys were used to measure the attitudes and opinions of both the treatment group (n=50) and control group (n=21), while pre- and post-assessments were employed to assess the effectiveness of the intervention. The results showed that there was statistically significant improvement of pronunciation between the pre- and post-assessments of the treatment group, suggesting that the intervention was successful in improving participants' pronunciation. However, the survey results indicated no significant differences between groups in autonomy, self-efficacy beliefs, or motivation pre- and post-intervention. This highlights the need to couple technology tools with explicit strategies and support for promoting autonomy, self-efficacy, and motivation.

Keywords: pronunciation, Japan, EFL, pronunciation, autonomy, self-efficacy, motivation

Introduction

Pronunciation instruction and practice in the EFL classroom, which once held a prominent role in the era of the audiolingual method, has diminished recently with the advent of new teaching approaches, such as communicative language teaching (CLT) (Mompean & Fouz-Gonzalez, 2016). Fluency took priority over accuracy, which meant that instruction to achieve "native-like" pronunciation became less desired. In addition, many teachers find it difficult to incorporate pronunciation for many reasons (Gilakjani, 2016), and limited, inconsistent pronunciation instruction typical of many language classrooms has minimal impact on improving students' L2 pronunciation accuracy over time (Sturm, 2019). Class time is instead on higher priority content and skills, such as practicing grammar and vocabulary in conversation, or completing communicative, fluency-based activities. Compounding this issue, it can be hard to know what and how to teach pronunciation due to the wide range of Englishes to choose

CITATION | Sanchez, B. L., & Elkassas, S. (2025). Using Google Docs Mobile Application for Autonomous Pronunciation Practice in a Japanese University EFL Program. *Computer-Assisted Language Learning Electronic Journal (CALL-EJ), 26*(1), 173-199. DOI: https://doi.org/10.54855/callej.2526111

from, especially considering the vast differences among them regarding accent, dialect, grammar, and vocabulary. Additionally, there is also the issue of a lack of materials and objectives targeted towards improving English pronunciation.

Furthermore, despite the growing popularity of speaking-focused methods like CLT, the grammar-translation method (GTM) is still prevalent in many EFL contexts, especially in Asia, and thus speaking is either not prioritized or is completely nonexistent (Spahiu & Kryeziu, 2021). However, pronunciation instruction is vital because intelligibility between English speakers, whether native or non-native, requires a level of mastery over specific segmentals and suprasegmentals that could otherwise lead to ambiguity or miscommunication (Gilakjani, 2016). For instance, confusing L with R can lead to misunderstandings on a semantic level, whereas incorrect stress placement can lead to misunderstandings of tone, attitude, or meaning.

Japanese students, in particular, are at a disadvantage when it comes to attaining speaking skills, compared to their counterparts in other Asian countries. Japan is a largely homogenous, monolingual island country (Matsuya, 2003). While English is seen as a sign of modernity in Japanese society (Hiramoto, 2013), and English is a compulsory subject from primary through secondary grades, many young Japanese people enter university unequipped with the level of English often required for the jobs and/or study abroad plans they desire to pursue after graduation. Thus, their university years are crucial for gaining a level of English-speaking ability that is intelligible to speakers unfamiliar with Japanese accentedness. Because students must be able to communicate with native and native-like English speakers, the pronunciation support given to these students should include feedback from native-like sources. However, often the only time students get native-like feedback is in the classroom or at an English conversation school called Eikawa. At the university level, studying at such schools is not likely because of the heavy workload from their classes, their part-time jobs, and the costs associated with such schools.

Thus, it stands to reason that practicing pronunciation from a free mobile platform, designed for native-like speakers, would be a logical solution. The process would be more learner-centered, more accessible, and provide students with the native-like feedback they wouldn't otherwise receive outside of the university. Other studies have shown a positive effect on students' pronunciation through the use of smartphone applications (Akkara et. al., 2020) and speech analysis software (Olson, 2014). Despite the slight increase in ICT skills due to the COVID-19 pandemic, Japan ranks low in computer usage (Lim, 2023). Thus, using mobile phones that they are proficient in may increase the likelihood that they will use the app to practice their pronunciation autonomously.

The purpose of this mixed-methods, quasi-experimental study is to determine whether or not the intervention helped improve their pronunciation, autonomy, self-efficacy beliefs, and motivation to continue practicing their pronunciation.

Research Questions

RQ 1. Does the use of the speech-to-text feature in Google Docs for pronunciation practice improve students' pronunciation?
RQ 2. Does the use of the speech-to-text feature in Google Docs for pronunciation practice promote student autonomy in improving their pronunciation outside of the classroom?
RQ 3. Does the use of the speech-to-text feature in Google Docs for pronunciation practice increase students' beliefs about self-efficacy in improving their pronunciation outside of the classroom?

RQ 4. Does the use of the speech-to-text feature in Google Docs for pronunciation practice increase student motivation to practice pronunciation outside of the classroom?

To answer these questions, the researchers conducted a quasi-experimental study, which took place over two fifteen-week semesters in a Basic Speaking course at a private Japanese international university. The course, which met once a week for 90 minutes, was designed to improve students' English listening and speaking skills through focused practice in note-taking, discussions, pronunciation, and presentations. The course used Cengage's *Keynote Series, TED Talks 1*.

Methods

Participants

There were a total of 71 participants aged 18-19 in their freshman year at a private Japanese international university. All participants were considered intermediate learners, with a CEFR level around A2. The participants were divided into two groups: a treatment group of 50 participants and a control group of 21 participants. The treatment group was divided into four sections taught by the researchers, and the control group was divided into two sections taught by a colleague in the same department who used the same textbook and followed a similar syllabus.

Procedures

In the fall semester, a pre-assessment (see Appendix A) and a pre-survey (see Appendix B) were administered to all participants. During the semester, both groups participated in their respective classes; however, the treatment group engaged in an additional weekly activity utilizing the speech-to-text function in the Google Docs application on their smartphones to record their pronunciation of sentences. The sentences were carefully selected to consider authentic language, necessary TOEIC vocabulary, and a range of phonemes (See Appendix D). Both the teacher-researchers and the students evaluated their progress and worked on specific pronunciation errors identified by the students. At the end of the semester, all participants completed the post-assessment (see Appendix A) and the post-survey (see Appendix C).

Instruments

The pre-assessment chosen for this study was the Power Pronunciation Speech Test, created by English Computerized Learning Inc. (See Appendix A). The test consisted of 52 sentences to be recorded and analyzed for accuracy. After the assessment, the participants received a percentage score and a report on their accuracy of specific phonemes (See Appendix A).

The pre-survey consisted of 15 items, which were randomized to discourage students from marking the same answer on items that appeared to have similar topics. This survey aimed to provide quantitative data regarding participants' perceptions of the importance of learning pronunciation, their perceived ability to learn pronunciation, personal learning autonomy, and the affordances of the mobile technology they use to practice their pronunciation. The survey was available in Japanese to mitigate any potential miscommunication issues.

The post-survey reiterated the original questions and introduced four additional ones, gauging students' perceptions of Google Docs' ease of use and speech-to-text functionality, as well as their likelihood of future usage. Additionally, it provided an open-ended opportunity for further feedback.

Data Analysis

The data from both the assessments and surveys was first anonymized, coded, and cleaned. Survey questions were categorized as either motivation, autonomy, or self-efficacy, and the corresponding question responses were averaged to produce one mean score per participant per category. A descriptive statistical analysis was conducted to identify the trends and relationships among the different variables. A paired T-test was then used to measure the impact of the intervention on the treatment group as well as the differences in autonomy, self-efficacy beliefs, and motivation. Independent samples T-tests were also employed to determine whether there were any statistically significant differences between the treatment and control groups on both the pre- and post-assessments and surveys. Paired T-tests and independent samples tests were also used to measure the differences in autonomy, self-efficacy beliefs, and motivation pre- and post-intervention.

Results

Descriptive Statistics

On the pre-assessment, the treatment group had a lower mean score of 30.6 compared to the control group's mean of 27.476. On the post-assessment, the treatment group mean was higher at 36.32 than the control group mean of 28.667. The standard deviations were fairly similar between groups, ranging from 10.451 to 11.878, which indicates similar variance in scores.

Post-assessment results demonstrated improvements, with the treatment group achieving a higher mean of 36.32 compared to the control group's mean of 28.667. The standard deviations in both groups were similar, indicating comparable score variances. Notably, the treatment group displayed a substantial mean score increase of 5.72 points between pre and post-assessments, while the control group exhibited a more modest 1.191 point increase. From this descriptive analysis, it appears that the treatment group experienced a more significant improvement in scores compared to the control group..

Table 1.

Descriptive Statistics of Pre- and Post-assessment for Treatment and Control Groups

Descriptive Statistics

	PRE-ASSMT TRT	POST-ASSMT TRT	PRE-ASSMT CTRL	POST-ASSMT CTRL
Valid	50	50	21	21
Missing	21	21	50	50
Mode [a]	26.000	26.000	32.000	22.000
Median	30.500	36.000	30.000	29.000
Mean	30.600	36.320	27.476	28.667
Std. Deviation	10.633	11.878	11.369	10.451
Minimum	3.000	9.000	7.000	3.000
Maximum	49.000	62.000	54.000	53.000

[a] More than one mode exists, only the first is reported

Paired T-tests

Following the descriptive analysis, paired T-tests were run to check the statistical significance of the pre- and post-assessment scores on the treatment and control groups. First, the control group was analyzed using a Student's test due to normal distribution according to the Shapiro-Wilk test. A p-value of 0.212 shows that there was no statistical significance in the control group's pre- to post-assessment scores.

Table 2.

Paired samples T-test on pre-post assessment for the control group

Paired Samples T-Test

Measure 1		Measure 2	t	df	p	Cohen's d	SE Cohen's d
POST-ASSMT CTRL	-	PRE-ASSMT CTRL	0.815	20	0.212	0.178	0.134

Note. For all tests, the alternative hypothesis specifies that POST-ASSMT CTRL is greater than PRE-ASSMT CTRL.
Note. Student's t-test.

Assumption Checks

Test of Normality (Shapiro-Wilk)

			W	p
POST-ASSMT CTRL	-	PRE-ASSMT CTRL	0.966	0.648

Note. Significant results suggest a deviation from normality.

However, the treatment group showed quite different results. A Wilcoxon test was used due to deviation from normality. The p-value of <0.001 suggests that the increase between pre- and post-assessment scores is statistically significant.

Table 3.

Paired samples T-test on pre-post assessment for the treatment group

Paired Samples T-Test

Measure 1		Measure 2	W	z	df	p	Rank-Biserial Correlation	SE Rank-Biserial Correlation
POST-ASSMT TRT	-	PRE-ASSMT TRT	996.000	4.185		< .001	0.694	0.164

Note. For all tests, the alternative hypothesis specifies that POST-ASSMT TRT is greater than PRE-ASSMT TRT.
Note. Wilcoxon signed-rank test.

Assumption Checks

Test of Normality (Shapiro-Wilk)

			W	p
POST-ASSMT TRT	-	PRE-ASSMT TRT	0.936	0.009

Note. Significant results suggest a deviation from normality.

Independent T-tests

In addition to the paired T-tests, independent samples T-tests were also run to determine if the difference between the pre- and post-assessment of the treatment group was significantly higher than the difference between pre- and post-assessment of the control group. Because the variances of equality were not normal, a Welch test was used. The p-value of 0.012 suggests that the difference between the pre- and post-assessment of the treatment group is significantly higher than the difference between pre- and post-assessment of the control group, which confirms the findings from the paired T-tests.

Table 8.

Independent samples T-test on difference between pre- and post- assessment for treatment and control groups

Independent Samples T-Test

	Test	Statistic	df	p
DIF ASSMT ALL	Student	−2.063	69.000	0.021
	Welch	−2.332	50.455	0.012

Note. For all tests, the alternative hypothesis specifies that group *0* is less than group *1* .

Assumption Checks

Test of Equality of Variances (Levene's)

	F	df_1	df_2	p
DIF ASSMT ALL	1.059	1	69	0.307

Additionally, an independent samples T-test was run on both the pre- and post-assessment scores for both the treatment and control groups. A Welch test was run due to deviation from normality. The p-value of 0.144 suggests that any observed differences between the pre-assessment scores of the treatment and control groups are not statistically significant. The results for the post-assessment, however, show a statistically significant difference between the treatment and control groups. The low p-value of 0.005 indicates that the intervention had a significant impact on the treatment group.

Table 9.

Independent samples T-test on all scores between pre- and post- assessment for treatment and control groups

Independent Samples T-Test ▼

	t	df	p
PRE-ASSMT ALL	−1.077	35.441	0.144
POST-ASSMT ALL	−2.702	42.481	0.005

Note. For all tests, the alternative hypothesis specifies that group *0* is less than group *1* .
Note. Welch's t-test.

Assumption Checks ▼

Test of Equality of Variances (Levene's) ▼

	F	df_1	df_2	p
PRE-ASSMT ALL	0.260	1	69	0.612
POST-ASSMT ALL	1.619	1	69	0.208

Autonomy, Self-efficacy, and Motivation

First, a descriptive analysis was run determine any clear differences from pre- to post-survey regarding the autonomy, self-efficacy, and motivation question categories. The results of a descriptive analysis on autonomy show that the mean score of the treatment group slightly increased from 4.675 to 4.700 post-intervention, but the standard deviation slightly increased to 1.030 from 0.866, meaning that there was more variability post-intervention. The scores in the treatment group remained consistent pre- to post-intervention, with a minimum of 3.000 and a maximum of 6.000, with most closely clustered around the mean. However, the control group began with a lower mean score of 4.500 and a higher standard deviation of 1.140. The scores in this group varied from a minimum of 2.500 to a maximum of 6.000 pre-intervention but increased to a minimum of 3.500 and a maximum of 6.000 post-intervention. The mean score of the control group increased to 4.667, with a lower standard deviation of 0.871 post-intervention. From these results, it appears that both the treatment and control groups experienced increases in mean scores, albeit slightly. The treatment group had lower variability in scores compared to the control group, and the control group showed a similar increase in the mean score to the treatment group.

Table 12.

Descriptive analysis of treatment and control groups regarding autonomy

Descriptive Statistics

	PRE-AUT TRT	POST-AUT TRT	PRE-AUT CTRL	POST-AUT CTRL
Valid	40	40	21	21
Missing	31	31	50	50
Mean	4.675	4.700	4.500	4.667
Std. Deviation	0.866	1.030	1.140	0.871
Minimum	3.000	3.000	2.500	3.500
Maximum	6.000	6.000	6.000	6.000

The results of the descriptive analysis for self-efficacy beliefs show that the mean score of the treatment group slightly increased from 4.304 to 4.329 post-intervention, but the standard deviation slightly increased from 0.558 to 0.693, meaning that there was more variability post-intervention. The range of scores in the treatment group decreased pre- to post-intervention, with a minimum of 3.167 and a maximum of 6.000 pre-intervention, to a minimum of 3.000 and a maximum of 6.000 post-intervention. Interestingly, the control group began with a lower mean score of 4.195 and a lower standard deviation of 0.504 but the mean score increased substantially to 4.405 post-intervention. However, the standard deviation also increased substantially to 0.735, which is higher than the treatment group post-intervention. The scores in this group varied from a minimum of 3.167 to a maximum of 5.000 pre-intervention but increased to a minimum of 3.333 and a maximum of 6.000 post-intervention. From these results, it appears that the control group improved more than the treatment group, but the treatment group had lower variability in scores compared to the control group.

Table 13.

Descriptive analysis of treatment and control groups regarding self-efficacy beliefs

Descriptive Statistics

	PRE-SLFEF TRT	POST-SLFEF TRT	PRE-SLFEF CTRL	POST-SLFEF CTRL
Valid	40	40	21	21
Missing	31	31	50	50
Mean	4.304	4.329	4.195	4.405
Std. Deviation	0.558	0.693	0.504	0.735
Minimum	3.167	3.000	3.167	3.333
Maximum	6.000	5.667	5.000	6.000

The results from descriptive analysis on motivation show that the mean score of the treatment group slightly decreased from 5.225 to 5.175 post-intervention, and the decrease in standard deviation slightly was almost neglible at 0.866 from 0.869. The range of scores in the treatment group decreased pre- to post-intervention, with a minimum of 3.000 and a maximum of 6.000 pre-intervention, to a minimum of 2.500 and a maximum of 6.000 post-intervention. Similar to the results of the self-efficacy test, the control group began with a lower mean score of 5.048 and a lower standard deviation of 0.820 but the mean score increased substantially to 5.214 post-intervention with a substantial decrease in standard deviation to 0.699, which is lower than the treatment group both pre- and post-intervention. The scores in this group were the same as the treatment group pre-intervention, but drastically higher post-intervention with a minimum of 4.000 to a maximum of 6.000. From these results, it appears that the control group improved substantially more than the treatment group, had a lower variability in their scores, and had a smaller range in their scores leaning towards the higher end compared to the treatment group.

Table 14.

Descriptive analysis of treatment and control groups regarding motivation

Descriptive Statistics

	PRE-MOTV TRT	POST-MOTV TRT	PRE-MOTV CTRL	POST-MOTV CTRL
Valid	40	40	21	21
Missing	31	31	50	50
Mean	5.225	5.175	5.048	5.214
Std. Deviation	0.869	0.866	0.820	0.699
Minimum	3.000	2.500	3.000	4.000
Maximum	6.000	6.000	6.000	6.000

However, to determine the statistical significance of these findings, paired T-tests were run for the survey responses on autonomy, self-efficacy beliefs, and motivation. The results showed that there were no statistically significant differences found between the treatment and control groups in any of the pre- to post-survey categories.

Table 15.

Paired T-test on differences between treatment and control groups regarding autonomy

Paired Samples T-Test

Measure 1		Measure 2	Test	Statistic	z	df	p	Effect Size	SE Effect Size
POST-AUT TRT	-	PRE-AUT TRT	Student	0.143		39	0.443	0.023	0.183
			Wilcoxon	235.000	0.051		0.483	0.011	0.206
POST-AUT CTRL	-	PRE-AUT CTRL	Student	0.892		20	0.192	0.195	0.180
			Wilcoxon	64.500	1.328		0.091	0.418	0.305

Note. For all tests, the alternative hypothesis specifies that Measure 1 is greater than Measure 2. For example, POST-AUT TRT is greater than PRE-AUT TRT.

Note. For the Student t-test, effect size is given by Cohen's *d*. For the Wilcoxon test, effect size is given by the matched rank biserial correlation.

Assumption Checks ▼

Test of Normality (Shapiro-Wilk) ▼

			W	p
POST-AUT TRT	-	PRE-AUT TRT	0.973	0.433
POST-AUT CTRL	-	PRE-AUT CTRL	0.815	0.001

Note. Significant results suggest a deviation from normality.

Table 16.

Paired T-test on differences between treatment and control groups regarding self-efficacy beliefs

Paired Samples T-Test

Measure 1		Measure 2	Test	Statistic	z	df	p	Effect Size	SE Effect Size
POST-SLFEF TRT	-	PRE-SLFEF TRT	Student	0.286		39	0.388	0.045	0.136
			Wilcoxon	307.500	−0.123		0.552	−0.024	0.191
POST-SLFEF CTRL	-	PRE-SLFEF CTRL	Student	1.372		20	0.093	0.299	0.242
			Wilcoxon	145.500	1.043		0.152	0.260	0.244

Note. For all tests, the alternative hypothesis specifies that Measure 1 is greater than Measure 2. For example, POST-SLFEF TRT is greater than PRE-SLFEF TRT.

Note. For the Student t-test, effect size is given by Cohen's *d*. For the Wilcoxon test, effect size is given by the matched rank biserial correlation.

Assumption Checks ▼

Test of Normality (Shapiro-Wilk)

			W	p
POST-SLFEF TRT	-	PRE-SLFEF TRT	0.957	0.136
POST-SLFEF CTRL	-	PRE-SLFEF CTRL	0.936	0.179

Note. Significant results suggest a deviation from normality.

Table 17.

Paired T-test on the differences between treatment and control groups regarding motivation

Paired Samples T-Test

Measure 1		Measure 2	Test	Statistic	z	df	p	Effect Size	SE Effect Size
POST-MOTV TRT	-	PRE-MOTV TRT	Student	−0.473		39	0.319	−0.075	0.122
			Wilcoxon	148.000	−0.390		0.349	−0.089	0.225
POST-MOTV CTRL	-	PRE-MOTV CTRL	Student	1.195		20	0.877	0.261	0.184
			Wilcoxon	63.500	1.258		0.911	0.396	0.305

Note. For all tests, the alternative hypothesis specifies that Measure 1 is less than Measure 2. For example, POST-MOTV TRT is less than PRE-MOTV TRT.

Note. For the Student t-test, effect size is given by Cohen's *d*. For the Wilcoxon test, effect size is given by the matched rank biserial correlation.

Assumption Checks ▼

Test of Normality (Shapiro-Wilk)

			W	p
POST-MOTV TRT	-	PRE-MOTV TRT	0.944	0.047
POST-MOTV CTRL	-	PRE-MOTV CTRL	0.925	0.111

Note. Significant results suggest a deviation from normality.

An independent samples T-test was used to compare the differences between the pre- and post-surveys for the three categories. The results showed that there was no statistical significance when comparing the two groups, confirming the results of the paired T-tests.

Table 18.

Independent T-test on differences between treatment and control groups on autonomy, self-efficacy beliefs, and motivation

Independent Samples T-Test

	Test	Statistic	df	p	Cohen's d	SE Cohen's d
DIF MOTV ALL	Student	1.230	60.000	0.888	0.330	0.273
	Welch	1.243	41.592	0.890	0.332	0.273
DIF SLFEF ALL	Student	1.299	69.000	0.901	0.338	0.265
	Welch	1.129	28.710	0.866	0.313	0.264
DIF AUT ALL	Student	0.512	59.000	0.695	0.138	0.270
	Welch	0.554	50.414	0.709	0.143	0.270

Note. For all tests, the alternative hypothesis specifies that group *0* is less than group *1* .

Assumption Checks ▼

Test of Equality of Variances (Levene's) ▼

	F	df_1	df_2	p
DIF MOTV ALL	5.291×10^{-4}	1	60	0.982
DIF SLFEF ALL	3.347	1	69	0.072
DIF AUT ALL	1.362	1	59	0.248

Discussion

This study aimed to investigate the effect of a Google Docs intervention on students' pronunciation skills, as well as their autonomy, self-efficacy, and motivation for pronunciation practice. The findings will be discussed in detail according to each research question.

Research Question 1: Does the use of the speech-to-text feature in Google Docs for pronunciation practice improve students' pronunciation?

The descriptive analysis showed that the treatment group experienced a more significant improvement in scores compared to the control group. The paired T-tests confirmed this finding, demonstrating that only the treatment group's improvement was statistically significant. These findings were further validated through the independent samples T-test comparing the differences between groups, which both showed the treatment group improvement was significant compared to the control. Taken together, these consistent results provide strong evidence that the intervention utilizing the Google Docs speech-to-text feature led to improved pronunciation accuracy for the treatment group participants.

Research Question 2: Does the use of the speech-to-text feature in Google Docs for pronunciation practice promote student autonomy in improving their pronunciation outside of the classroom?

The descriptive statistics showed a slight increase in mean scores for both the treatment and control groups, with the treatment group having lower variability. While the slight increase means that there was some improvement in students' autonomy, these results indicate the Google Docs intervention did not directly lead to increased perceptions of learner autonomy among the treatment group since the control group had similar gains. However, the paired T-tests and independent samples T-tests showed no statistically significant differences between the groups for autonomy, neither pre- nor post-intervention. This suggests that the class environment or other factors relating to university life might have played a bigger role in increasing autonomy than the intervention.

Research Question 3: Does the use of the speech-to-text feature in Google Docs for pronunciation practice increase students' beliefs about self-efficacy in improving their pronunciation outside of the classroom?

The descriptive statistics showed the control group had a substantial increase in mean self-efficacy scores post-intervention compared to the treatment group. This was a surprising result, as we expected the treatment group to potentially have higher gains in self-efficacy due to directly experiencing success in improving their pronunciation skills. However, the paired T-tests and independent samples T-tests showed there were no statistically significant differences between the groups for autonomy, neither pre- nor post-intervention.

One possible explanation for the control group's unexpected increase is that without the weekly practice and feedback from the speech-to-text feature, they had an inflated sense of self-efficacy unrelated to their actual skill level. In contrast, the treatment group received weekly concrete feedback about their pronunciation errors from the Google Docs mobile app. Seeing incorrect speech-to-text transcriptions of their recordings may have dampened their confidence in their abilities and lowered their judgments of self-efficacy despite their actual skills improving. These surprising results also suggest that more than just skill development is needed to increase self-efficacy beliefs. Dweck (2006) believes that fostering a growth mindset is impactful for motivation and learning. Students' implicit theories of intelligence, either fixed or growth-oriented, influence how they interpret their successes and failures. The treatment group

participants, despite objectively improving, may have held a more fixed mindset about language learning aptitude. Seeing inaccuracies in the speech-to-text feedback could have reinforced a belief that their pronunciation abilities are fixed and thus limited their self-efficacy.

On the other hand, the control group, which did not receive this consistent negative feedback, likely reinforced an assumption that their skills could continue improving. Their increased self-efficacy aligns with a growth mindset, which demonstrates the importance of cultivating growth mindsets in conjunction with pronunciation instruction, so students attribute skills to effort rather than innate ability. Essentially, the self-efficacy results illustrate that building skills does not automatically increase self-beliefs. Fostering adaptive thought patterns through growth mindset interventions could help students translate skill gains into enhanced self-efficacy. Teachers should frame abilities as malleable and promote positive self-talk after practice, which could support self-efficacy development along with pronunciation skills.

Research Question 4: Does the use of the speech-to-text feature in Google Docs for pronunciation practice enhance student motivation to practice pronunciation outside of the classroom?

Similar to self-efficacy beliefs, the descriptive statistics showed the control group had a sizeable increase in motivation mean scores post-intervention, while the treatment group slightly decreased. However, the T-tests again found no significant differences between the groups. These results suggest that mandating Google Docs practice may not directly increase student motivation in the same way that voluntary practice might. According to self-determination theory (Deci & Ryan, 1985), autonomous practice is more likely to enhance intrinsic motivation, whereas controlled practice can potentially diminish it. As with autonomy and self-efficacy, explicitly integrating motivation support strategies along with the practice could yield better motivational outcomes.

Limitations

There are several limitations worth noting. First, the treatment group was twice as large as the control group. This was due to both the limitations of available classes and also, ultimately, the ethical choice to provide the possible benefits of the intervention to more students. To mitigate any issues from an uneven comparison, four random samples of the treatment group were also tested. Another limitation was that Google Docs was the only mobile app used for pronunciation practice in the intervention; other apps were not compared or evaluated. However, because Google Docs is a free app that is readily available and easy to use, it was the best choice for our research. Finally, the instructors of the treatment and control groups were different. We acknowledge that the effects of different teaching styles could have influenced the results.

Conclusion

While the intervention utilizing the Google Docs mobile app for pronunciation was successful in improving participants' pronunciation skills, it did not directly lead to significant gains in learner autonomy, self-efficacy, or motivation. If teachers utilize the Google Docs speech-to-text feature for targeted pronunciation, there are clear and statistically significant benefits; however, they must consider ways to mitigate the potential negative effects we have discussed in this article. Supplementing pronunciation practice with autonomy-supportive teaching strategies could help foster the development of self-determined learners. Pronunciation instruction should focus not only on skills but also on the underlying psychological processes that drive successful autonomous learning, leading to higher self-efficacy beliefs and, consequently, higher motivation.

Future studies could utilize interventions coupling technology tools with explicit teaching of strategies to support autonomy, growth mindset, and motivation, which could explore synergistic benefits on both skill development and psychological outcomes. Additionally, comparisons utilizing alternative speech recognition tools or custom-designed mobile apps for pronunciation may reveal more precisely tuned recognition and sensitive error detection than Google Docs. It is also vital to consider the adaptability of speech recognition tools. Google speech-to-text has become more accurate in detecting sentences despite errors in pronunciation; while good for society as a whole, this advancement in technology is less helpful to language learners seeking tools to help identify their pronunciation mistakes.

In conclusion, further research is needed to identify the best methods that not only improve learners' pronunciation but also have a positive impact on their motivation, autonomy, and self-efficacy beliefs. With the rapid advancements in artificial intelligence and speech recognition, researchers must stay abreast of technological innovations that could potentially enhance pronunciation assessment and pedagogy in more effective ways.

Acknowledgements

The completion of this research study would not have been possible without Don Hansen. His passion and contributions were instrumental throughout the research design and implementation process. Additionally, we would like to express gratitude to Kelly Nelson for her participation and support. We would also like to thank Dr. Jin Liu for her invaluable guidance on the analysis of our data and feedback during the writing process. Lastly, we would like to give our heartfelt thanks to all of the participants who generously gave their time and insights.

References

Akkara, S., Mallampalli, M. S., & Anumula, V. S. (2020). Improving second language speaking and pronunciation through smartphones. *International Journal of Interactive Mobile Technologies (iJIM), 14*(11), 280–287. https://doi.org/10.3991/ijim.v14i11.13891

Deci, E. L., & Ryan, R. M. (1985). *Intrinsic motivation and self-determination in human behavior*. New York, NY: Plenum.

Gilakjani, A. P. (2016). English pronunciation instruction: A literature review. *International Journal of Research in English Education, 1*(1), 1–6.

Hiramoto, M. (2013b). English vs. English conversation *In* The Politics of English: South Asia, Southeast Asia and the Asia Pacific Edited by Lionel Wee, Robbie B.H. Goh and Lisa Lim. *Studies in World Language Problems*, 227–248. https://doi.org/10.1075/wlp.4.16hir

Lim, S. (2023). Are Japanese junior high school teachers ready for one-to-one devices in schools? A case study. *The Language Teacher, 47*(1), 3–9. https://doi.org/10.37546/jalttlt47.1-1

Matsuya, Y. (2003). English teaching in Japan. *California Linguistic Notes, 28*(1), 1-19.

Mompean, J. Antonio & Fouz-González, J. (2016). Twitter-based EFL pronunciation instruction. *Language Learning & Technology, 20*(1), 166–190. http://dx.doi.org/10125/44451

Spahiu, I., & Kryeziu, N. (2021). A contrastive study of grammar translation method and direct method in teaching of English language to primary school pupils. *Linguistics and Culture Review, 5*(S2), 1022-1029.

Sturm, J. (2019). Current approaches to pronunciation instruction: A longitudinal case study in French. *Foreign Language Annals, 52*(1), 32-44. https://doi.org/10.1111/FLAN.12376

Wongsuriya, P. (2020). Improving the Thai students' ability in English pronunciation through mobile application. *Educational Research and Reviews, 15*(4), 175–185. https://doi.org/10.5897/ERR2020.3904

Biodata

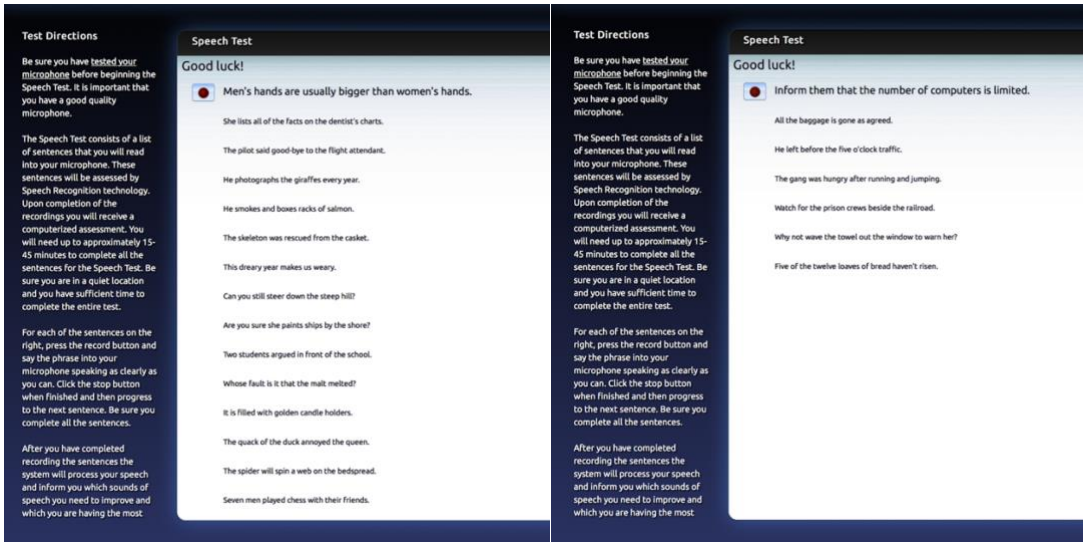
Becky Sanchez, M.A. is a researcher and instructor of foreign languages. She currently teaches English and academic literacy courses at Rikkyo University and Gakushuin University, as well as Spanish and Business English at Kanda Gaigo Career College. Becky has presented at numerous international conferences on various research interests, including educational technology, 21st-century skills for language learners, and flipped learning in language education. She received a Bachelor of Arts with a double major in English and Spanish Linguistics and a Master of Arts specializing in second language acquisition and teaching. Becky is currently a Doctor of Education (Ed.D) candidate in the Learning Design and Technologies program at the University of South Carolina, USA.

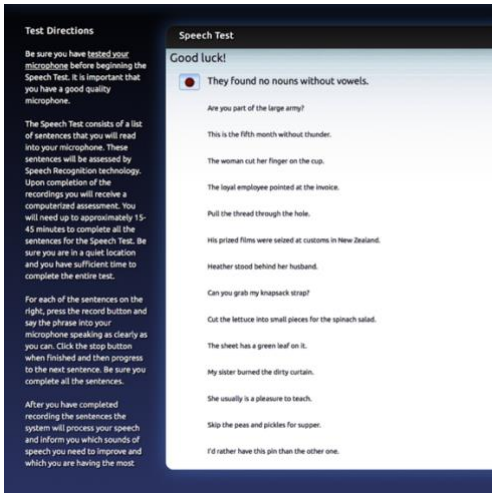
Shady Elkassas, M.Ed. is a research and development manager at Perfect Purity. Shady is a multiple award-winning and passionate educator. He is a winner of the Khalifa Award of Education Excellence and the Middle East Education Influencer Award. His career in education spans over 15 years. He worked as a teacher, head of the department, academic coordinator, innovation director, and vice principal. Additionally, he is TEDx organizer and has been selected to speak at many National and international education conferences in the MENA region. His qualifications include a Bachelor of Science, an Executive Management Diploma, and a Master of Science in Education. Shady is currently a Doctor of Education (Ed.D) candidate in the Learning Design and Technologies program at the University of South Carolina, USA.

Appendix A

The link below is the pronunciation test that was used for the pre- and post- test for both the treatment and control group. https://englishlearning.com/#speechtest

The images below are the sentences that the participants spoke into the microphone to test their pronunciation accuracy at the phoneme level.





The image below is an example of the results from the above pronunciation test which highlights the pronunciation errors by phoneme.

Appendix B

Part I

This survey is being conducted to understand how Japanese university students feel about English pronunciation and how they practice their English pronunciation. This is not a test. There are no “right” or “wrong” answers, so please answer each question honestly. Your privacy will be protected and only the researchers will see your information. Thank you so much for your help!

この調査は、日本の大学生が英語の発音をどのように感じるのか、どのように英語の発音を練習するのかを理解するために行われています。これはテストではありません。または「間違った」回答はないので、正直に各質問に答えてください。あなたのプライバシーは保護され、研究者だけがあなたの情報を見ることになります。手伝ってくれてどうもありがとう！

Part One: Explanation and Example Item (説明と例題)

In this part, please tell us how much you agree or disagree with the following statements by choosing a number from 1 to 6. Please do not leave out any of items.

この部分では、1 から 6 までの番号を選択して、次の陳述にどれだけ同意するか、または同意しないかを教えてください。

Strongly disagree ● disagree ● somewhat disagree ● somewhat agree ● agree ● strongly agree
強く同意しない●同意しない●少し反対●多少は同意します● 同意する●強く同意します

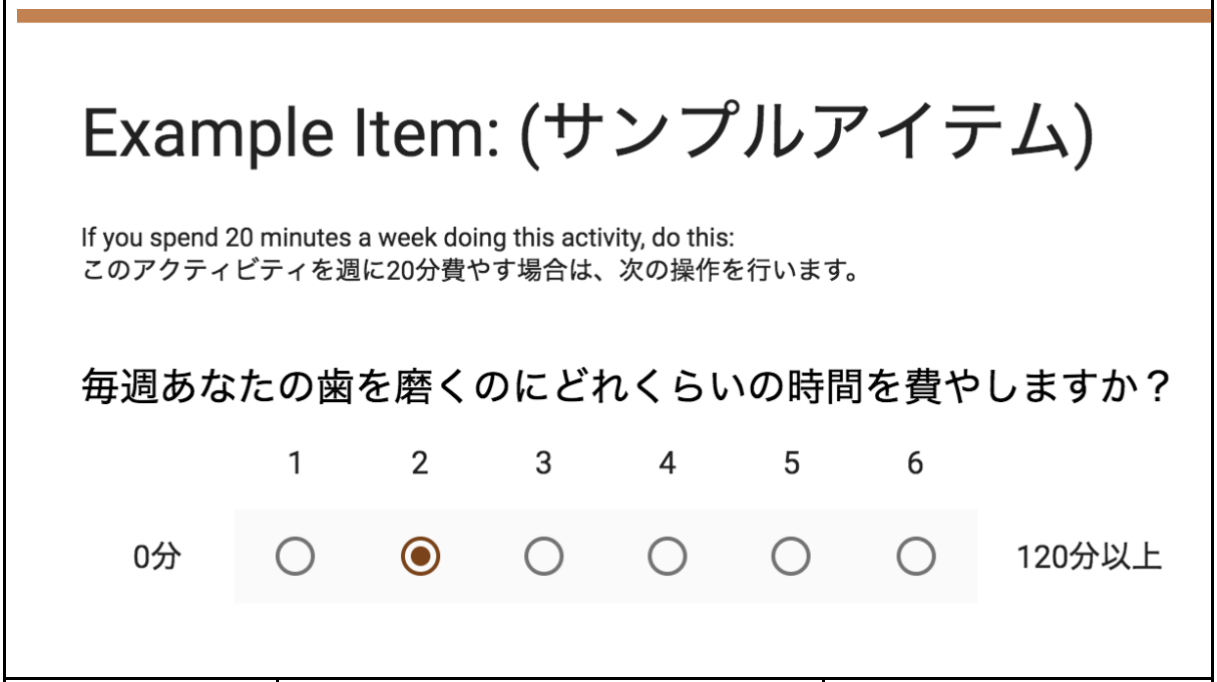
Question number	English version	Japanese translation

1	I enjoy learning about English pronunciation.	私は英語の発音について学ぶのが楽しいです。
2	I think my English pronunciation is natural and accurate.	自分の英語の発音が自然で正確であると思います。
3	I think someone who speaks proficient English can understand what I say.	熟練した英語で話せる人は、私の言葉を理解することができると思います。
4	It is important to me to pronounce words correctly in English.	単語を正確に英語で発音することは私にとって重要です。
5	Without accurate English pronunciation, I don't think I can communicate well with others.	正確な英語の発音がなければ、私は他の人とよくコミュニケーションできないと思います。
6	I think it is possible to improve my English pronunciation.	私の英語の発音を改善することは可能であると思います。
7	You can practice anytime during the day to improve your English pronunciation.	日中いつでも練習して英語の発音を向上させることができます。
8	I think you can improve your English pronunciation in various places during your daily life.	日常で開いている時間でいろいろな場所で自分の英語の発音を向上させることができると思います。
9	I think I can improve my English pronunciation at university.	私は、大学で英語の発音を向上させることができると思います。
10	I think I can improve my English pronunciation in order to actually speak with skilled English speakers.	私は、熟練した英語の話し手との実際に話すために、私の英語の発音を改善することができると思います。

11	Technology (personal computers, apps, etc.) can help improve English pronunciation.	技術(パサコン、アプリなど）は英語の発音を改善するのに役立ちます。
Part II		
Part Two: Explanation and Example Item (説明と例題) In this section, please tell us how often you do something every week. このセクションでは、あなたが何かする頻度を教えてください。 Never ● once ● 2-3 times ● 4-6 times ● every day 決して ● 一度 ● 2〜3 回 ● 4〜6 回 ● 毎日		
12	How many times a week do you practice English pronunciation for academic purposes outside of class?	週に何回ぐらい授業外の学業目的で英語の発音を練習しますか？
13	How many times a week do you practice English pronunciation for non-academic purposes outside of class?	週に何回ぐらい授業以外での非学業目的の英語発音を練習しますか？
Part III		
Explanation and Example Item (説明と例題)		

In this section, please tell us how much time you spend on something.
このセクションでは、あなたが何かに費やす時間を教えてください。

0 minutes ● <30 minutes ● 30-59 minutes ● 60-89 minutes ● 90-119 minutes ● 120+ minutes
0 分 ● 30 分未満 ● 30〜59 分 ● 60〜89 分 ● 90〜119 分 ● 120 分以上



14	How much time per week do you spend practicing English pronunciation for academic purposes outside of class?	授業外で学業目的で英語の発音を練習するのに一週間にどれくらい時間を費やしますか？
15	How much time per week do you spend practicing English pronunciation for non-English purposes outside of class?	授業以外の場所で英語以外の目的で英語の発音を練習するのに一週間にどれくらい時間を費やしますか？

Appendix C

Part I

This survey is being conducted to understand how Japanese university students feel about English pronunciation and how they practice their English pronunciation. This is not a test. There are no “right” or “wrong” answers, so please answer each question honestly. Your privacy will be protected and only the researchers will see your information. Thank you so much for your help!

この調査は、日本の大学生が英語の発音をどのように感じるのか、どのように英語の発音を練習するのかを理解するために行われています。これはテストではありません。または「間違った」回答はないので、正直に各質問に答えてください。あなたのプライバシーは保護され、研究者だけがあなたの情報を見ることになります。手伝ってくれてどうもありがとう！

Part One: Explanation and Example Item (説明と例題)

In this part, please tell us how much you agree or disagree with the following statements by choosing a number from 1 to 6. Please do not leave out any of items.

この部分では、1 から 6 までの番号を選択して、次の陳述にどれだけ同意するか、または同意しないかを教えてください。

Strongly disagree ● disagree ● somewhat disagree ● somewhat agree ● agree ● strongly agree
強く同意しない●同意しない●少し反対●多少は同意します● 同意する●強く同意します

Question number	English version	Japanese translation

1	I enjoy learning about English pronunciation.	私は英語の発音について学ぶのが楽しいです。
2	I think my English pronunciation is natural and accurate.	自分の英語の発音が自然で正確であると思います。
3	I think someone who speaks proficient English can understand what I say.	熟練した英語で話せる人は、私の言葉を理解することができると思います。
4	It is important to me to pronounce words correctly in English.	単語を正確に英語で発音することは私にとって重要です。
5	Without accurate English pronunciation, I don't think I can communicate well with others.	正確な英語の発音がなければ、私は他の人とよくコミュニケーションできないと思います。
6	I think it is possible to improve my English pronunciation.	私の英語の発音を改善することは可能であると思います。
7	You can practice anytime during the day to improve your English pronunciation.	日中いつでも練習して英語の発音を向上させることができます。
8	I think you can improve your English pronunciation in various places during your daily life.	日常で開いている時間でいろいろな場所で自分の英語の発音を向上させることができると思います。
9	I think I can improve my English pronunciation at university.	私は、大学で英語の発音を向上させることができると思います。
10	I think I can improve my English pronunciation in order to actually speak with skilled English speakers.	私は、熟練した英語の話し手との実際に話すために、私の英語の発音を改善することができると思います。

11	Technology (personal computers, apps, etc.) can help improve English pronunciation.	技術(パサコン、アプリなど）は英語の発音を改善するのに役立ちます。
Part II		
Part Two: Explanation and Example Item (説明と例題) In this section, please tell us how often you do something every week. このセクションでは、あなたが何かする頻度を教えてください。 Never ● once ● 2-3 times ● 4-6 times ● every day 決して ● 一度 ● 2〜3 回 ● 4〜6 回 ● 毎日 Example Item: (サンプルアイテム) If you do this activity twice a week, do this: 週に2回このアクティビティを行う場合は、次の操作を行います。 あなたはスーパーマーケットにどれくらい頻繁に行くのですか？ 1 2 3 4 5 決して ○ ○ ◉ ○ ○ 毎日		
12	How many times a week do you practice English pronunciation for academic purposes outside of class?	週に何回ぐらい授業外の学業目的で英語の発音を練習しますか？
13	How many times a week do you practice English pronunciation for non-academic purposes outside of class?	週に何回ぐらい授業以外での非学業目的の英語発音を練習しますか？
Part III		
Explanation and Example Item (説明と例題) In this section, please tell us how much time you spend on something. このセクションでは、あなたが何かに費やす時間を教えてください。		

0 minutes ● <30 minutes ● 30-59 minutes ● 60-89 minutes ● 90-119 minutes ● 120+ minutes
0 分 ● 30 分未満 ● 30～59 分 ● 60～89 分 ● 90～119 分 ● 120 分以上

14	How much time per week do you spend practicing English pronunciation for academic purposes outside of class?	授業外で学業目的で英語の発音を練習するのに一週間にどれくらい時間を費やしますか？
15	How much time per week do you spend practicing English pronunciation for non-English purposes outside of class?	授業以外の場所で英語以外の目的で英語の発音を練習するのに一週間にどれくらい時間を費やしますか？

Part IV

Explanation and Example Item (説明と例題)

In this section, please tell us how easy it was to do something.
このセクションでは、何か簡単なことを教えてください。

Very difficult ● difficult ● somewhat difficult ● somewhat easy ● easy ● very easy
非常に難しい ● 難しい ● やや難しい ● やや簡単 ● 簡単 ● 非常に簡単

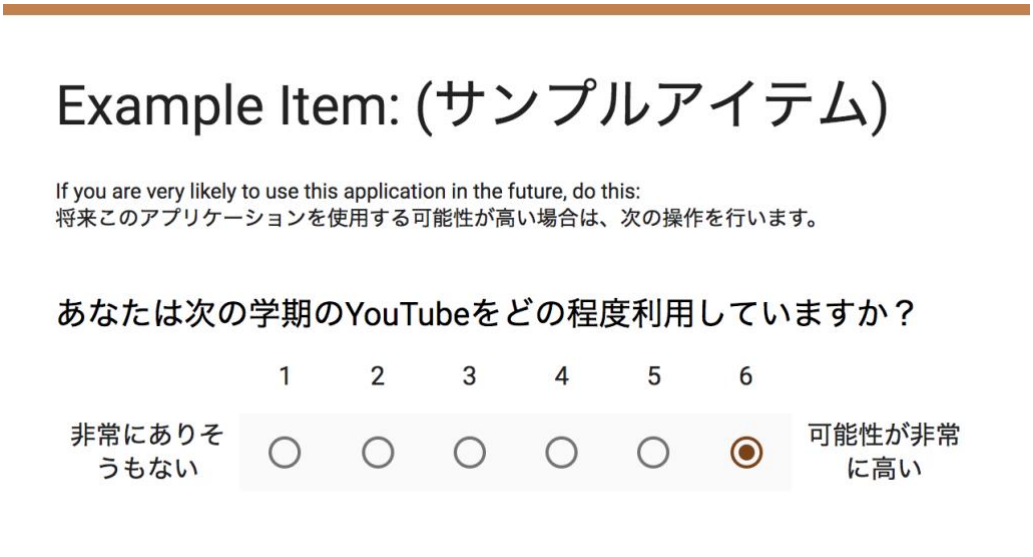
16	How did you like using Google Docs for pronunciation assignments?	発音割り当てに Google Docs を使うのはいかがでしたか？

Part V

Explanation and Example Item (説明と例題)

In this section, please tell us how likely you are to do something.
このセクションでは、あなたが何かをする可能性があることを教えてください。

Very unlikely ● unlikely ● somewhat unlikely ● somewhat likely ● likely ● very likely
非常にありそうもない ● 起こりそうもない ● ややありそうもない● やや可能性が高い ● おそら ● 可能性が非常に高い



17	How often do you continue to use Google Docs on your smartphone to practice pronunciation for academic purposes?	あなたのスマートフォンで引き続き Google Docs を使用して、学術目的の発音を練習するのはどれくらいでしょうか？
18	How often do you continue to use Google Docs on your smartphone to practice pronunciation for non-academic purposes?	あなたのスマートフォンで Google Docs を引き続き使用して、非学業目的の発音を練習するのはどれくらいですか？

Appendix D

/Æ/ What action does Mr. Petri threaten may happen? When traveling, you should give yourself a few days to recover from jet lag. Here at Happy Paws Animal Center, we take care of any pets that need help. We have drafted a contract on what we are prepared to invest. The traffic jam applies to all westbound and eastbound lanes while the roadwork is being carried out.	**/i/ /ɪ/ /ɛ/** This opening involves legal research, editing, and general office duties. Applicants should have computer skills and excellent written English. Employees in this section who wish to develop their skills should join this seminar. Invitations to the special seminar on communication have been sent to all the employees. Yet, she has volunteered many useful tips on how we could improve our processes there.
/ɑ/ /ə/ /^/ It is impossible for me to solve this problem. She is relied on not only by her colleagues but also by her clients. The advertising department will conduct a survey on consumers' attitudes toward their new product. All seminar participants must register in advance. The conference was attended by most employees compared with the previous one.	**/ʊ/ /u/** The book store opens at eight o'clock during July and August. The office has good access to both trains and buses. Some departments will be moving into the bookstore next quarter. Look for the list of printer models on the box. Apply by sending us a message if you think your family could offer a pet a new home.
/ɹ/ /l/ She lost almost all the coins she had collected. Be sure to bring your own lunch and plenty of liquids. Most full-time employees try to carry out their responsibilities in the proper manner.	**/ð/ /θ/ /s/** The museum is located at the corner of 14th and South Madison Avenue. Children were watching the game with their eyes shining.

Located downtown, the museum provides hands-on learning experiences for children. I want to go to the university library to study English linguistics.	Peace is achieved through tolerance and understanding of different views of the world. I like Susan and Betty, but I think that Susan is the nicer of the two. In the mall, I saw a woman who I thought was my aunt.
/f/ /h/ I am pleased to confirm our offer of part-time employment at Western Enterprises. If you have any questions, please feel free to contact human resources. The result is that they lose focus and fail to consider what is best for their company. Both strategies may be successful, but it is difficult to combine them effectively.	**/v/ /b/** They can improve their ability to communicate effectively across divisions. Smith Library is pleased to invite local groups to use the advertising space on its notice board. I wish to use your voicemail services for my transcription business. Color samples found in home improvement stores come with self-adhesive backing.
LT cluster / LD cluster Everyone on our team felt that it was a productive meeting. The result is that they lose focus and fail to consider what would work best for their own company. The recent worldwide increase in oil prices has led to more electric vehicles being sold. Despite some individual successes, this move is too bold and difficult.	**ST cluster / SP cluster / SK cluster** Tickets will not be redeemable for cash or credit at any time, nor will they be replaced if lost or stolen. As a research assistant, you will report to Dr. Smith, who will keep you informed of your specific duties and projects. As discussed, we will explore ways to adapt to the needs of the specialized departments. Register early if you would like to attend next Tuesday's presentation on risk management.