Can online translators and their speech capabilities help English learners improve their pronunciation?

Yue He[1] and Walcir Cardoso[2]

Abstract. This study investigated whether a translation tool (Microsoft Translator – MT) and its built-in speech features (Text-To-Speech synthesis – TTS – and speech recognition) can promote learners' acquisition in pronunciation of English regular past tense *-ed* in a self-directed manner. Following a pretest/posttest design, we compared 29 participants' performances of past *-ed* allomorphy (/t/, /d/, and /id/) by assessing their pronunciation in terms of phonological awareness, phonemic discrimination, and oral production. The findings highlight the affordances of MT regarding its pedagogical use for helping English as a Foreign Language (EFL) learners improve their pronunciation.

Keywords: translation tools, EFL, pronunciation learning, SDL.

1. Introduction

The literature reports a number of limitations that affect the teaching and learning of foreign languages, including insufficient time for students to practice (Life, 2011), which may negatively affect language teaching (Wahid & Sulong, 2013). To mitigate these limitations, one 'solution' is to encourage students to practice at their own time and pace (e.g. via Self-Directed Learning – SDL), outside the classroom. Studies have shown that technology-enriched environments are beneficial for the development of SDL behaviors (Mishra, Fahnoe, & Henriksen, 2013). Two speech technologies, TTS and Automatic Speech Recognition (ASR), have proved to positively impact L2 learning. Via TTS, learners have access to unlimited and varied input, which can raise their phonological awareness and aural perception (Liakin, Cardoso, & Liakina, 2017). Similarly, ASR can increase

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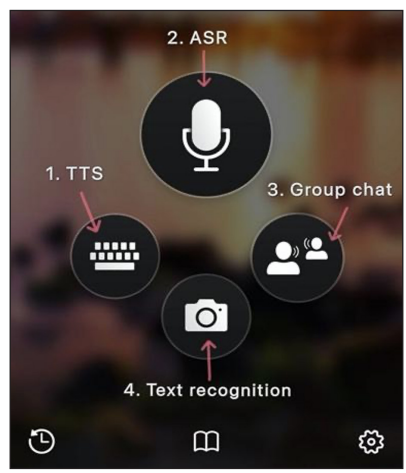
students' self-efficacy and provide them with instant feedback, thus facilitating their pronunciation development (Celce-Murcia, Brinton, Goodwin, & Griner, 2010). So far, only a handful of studies have combined ASR and TTS into a single tool to explore their effectiveness in fostering L2 learning (e.g. Van Lieshout & Cardoso, in press). Online translators, which have high levels of accessibility and availability, are tools that combine both technologies (see Figure 1). In our study, MT was adopted.

This study explores the affordances of these MT's speech capabilities for the development of English past *-ed* morphophonemics (/d/, /ɪd/, /t/ as in play/d/, visit/ɪd/ and walk/t/ respectively). It adopts Celce-Murcia et al.'s (2010) recommendations for pronunciation instruction (which also reflects its acquisition), starting with the development of phonological/sound awareness (Stage 1), proceeding to phonemic discrimination (Stage 2), and culminating with production (controlled, guided, and communicative – Stages 3, 4, and 5 respectively). Due to the short duration of our study (two hours of SDL), we examined the development of past *-ed* pronunciation for the initial three stages only.

The study was guided by the following research questions: (1) can EFL learners acquire aspects of past *-ed* morphophonemics using MT's TTS and ASR capabilities in an SDL manner (without direct guidance from an instructor), and (2) if yes, which of the three stages of pronunciation development is affected by the proposed instruction: phonological awareness, phonemic discrimination, and/or oral production?

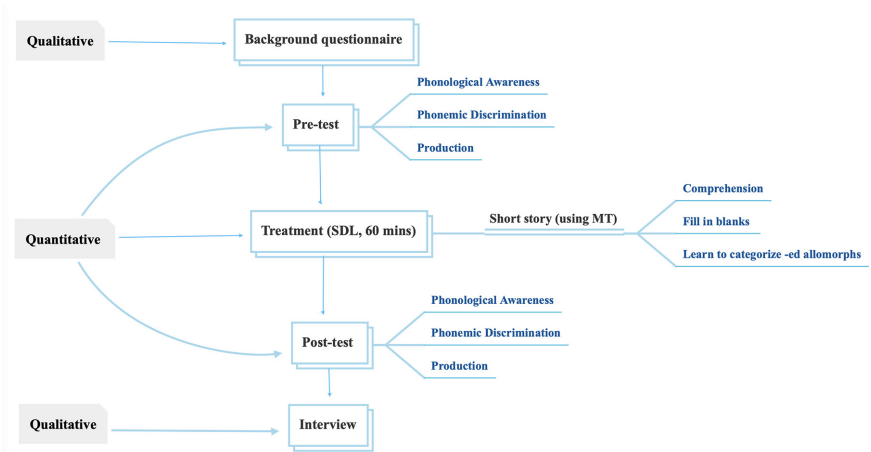
Figure 1. MT: interface and features



2. Method

Twenty-nine Chinese-speaking participants were recruited via convenient sampling (15 females and 14 males aged 16-18, intermediate English proficiency) at a secondary school in China. The study followed a pretest-posttest design. Participants first completed a background questionnaire, followed by the pretest, which included an assessment of their knowledge of English past *-ed* in terms of phonological awareness, phonemic discrimination, and oral production (as discussed earlier). After the 1-hour SDL treatment (conceptualized as a homework assignment), the posttest was conducted (a slightly modified version of the pretest). Finally, 15 participants were randomly invited to participate in an exit interview session. Figure 2 below illustrates a visual summary of the study design and procedures.

Figure 2. Research design and procedures



Pre and posttest were collected assuming the first three stages of Celce-Murcia et al.'s (2010) recommendation for pronunciation development (two tests for each stage): (1) phonological awareness (survey questions about the participants' phonological knowledge and an ABX test); (2) phonemic discrimination (the first task evaluated participants' ability to identify past versus non-past forms, while the second assessed their ability to discriminate among the three allomorphs); and (3) oral production (read-aloud task for controlled production and role-playing for spontaneous speech).

For the one-hour treatment, which was designed to emulate a homework assignment, participants were asked to install MT on their mobile devices (Android

or iOS). The learning materials were two English short stories, each including target past tense *-ed* words, with the number of each allomorph evenly distributed. All participants completed four activities for each story: (1) story comprehension; (2) listening to stories in TTS and filling in the blanks with the verbs they heard; (3) categorizing sets of *-ed* forms on how they sounded; and (4) speaking to the ASR for feedback (via the orthographic output).

3. Results and discussion

Due to space limitations, only the final stage of the statistical analysis is reported, without the effects of individual allomorphs. Table 1 summarizes the main findings observed (Standard Deviations – SDs – are only provided in the report when relevant).

For the first phonological awareness test (survey), observe that the number of participants who were rated as *Partially Aware* (PA) decreased (from 72% to 20.69%) while the number of *Fully Aware* (FA) increased (from 17.24% to 79.31%), indicating that the participants' phonological knowledge of past *-ed* pronunciation improved during the treatment. For the second phonological awareness test (ABX), t-test results show that the participants' overall phonological awareness significantly improved from pretest (M=0.733, SD=0.152) to posttest (M=0.782, SD=0.151), $t(28)$=-2.131, p=0.042<0.05.

Regarding the first phonemic discrimination test (past or non-past), we did not observe any significant improvements on the participants' ability to discriminate past from non-past constructions at the end of the experiment: M=0.705, SD=0.118 on the pretest, and M=0.703, SD=0.128 on the posttest, $t(28)$=0.117, p=0.908>0.05. Interestingly, for the second phonemic discrimination test (/t/, /d/, /id/ discrimination), the participants' ability to aurally discriminate among /t/, /d/, and /id/ significantly improved from pretest (M=0.427, SD=0.153) to posttest (M=0.474, SD=0.162), $t(28)$=-2.238, p=0.033<0.05.

Finally, for oral production, significant improvements were observed in the participants' performance in *-ed* pronunciation in the two tests, $t(28)$=-5.143, p=1.87493E-05<0.05 for read aloud, and $t(28)$=-5.925, p=0.000002<0.05 for role play.

Our results indicate that the participants significantly benefited from the proposed self-directed MT-based pedagogical treatment, thus corroborating the only previous

research available on the use of another translation tool with embedded speech capabilities (Google Translate; see Van Lieshout & Cardoso, in press). Although no significant improvements were observed in one of the listening discrimination tests (past versus non-past), their ability to identify individual *-ed* allomorphs significantly improved during the treatment, especially for allomorph /t/ (not illustrated in the statistical results). We can thus conclude that the pedagogical use of MT and its embedded TTS and ASR features can help learners acquire (at least aspects of) the target pronunciation feature, in at least three stages of L2 pronunciation development.

Table 1. Mean and t-test results

			Pretest		**Posttest**	
			%		**%**	**P value**
Phonological awareness	1. Survey	PA	72.41		20.69	**N/A
		FA	17.24		79.31	N/A
	2. ABX		73.33		78.16	*0.042
Phonemic discrimination	1. Past or Non-Past		70.47		70.26	0.908
	2. /t/, /d/, /id/ discrimination		42.67		47.41	*0.033
Oral production	1. Read aloud		67.93		77.47	*1.87493E-05
	2. Role play		68.39		74.71	*0.000

Note: all values are provided in percentages for ease of exposition (the number of target forms for each test is not uniform; for instance, while the read-aloud task had 30 items, the role-playing test consisted of 12 target words).

* The difference is statistically significant ($p \leq 0.05$)

** N/A=not applicable due to the nature of the computation

4. Conclusions

We conclude that participants were able to acquire aspects of past *-ed* morphophonemics (/t/, /d/, /id/) using MT's TTS and ASR on their own, as if completing a homework assignment. Additionally, three stages of pronunciation development (i.e. phonological awareness, phonemic discrimination, and oral production) were positively affected by the treatment, reflected in the participants' significant improvements. Despite the obvious limitations of this study, which should be addressed in future research (e.g. short treatment, focus on a single pronunciation feature, number of participants, lack of a control group), the main pedagogical implication is that instructors should encourage the self-directed use of online translators (e.g. DeepL Translator, Google Translate, MT) to extend the reach of the classroom (e.g. via technology-enhanced homework assignments) and thus alleviate some of the limitations that affect the EFL context, as discussed earlier.

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