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Improving EFL Students' Intonation In-Text Using Shadowing Technique with the Implementation of Google Text-to-Speech

Nhi Le Phuong[1], Linh Vu Hoang Mai[1*], Nhat Tran Minh[1]

[1]Hoa Sen University, Vietnam

Correspondence: Linh Vu Hoang Mai, Hoa Sen University, Vietnam. E-mail: linhvuhoang1908@gmail.com

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Abstract

Intonation, a feature of pronunciation that embarks on how an utterance is produced with respect to the notion of accent, stress and the rising/falling pitch, has always been considered troublesome to second language learners due to its connection to personal emotion. Recently, greater attention has been drawn from academia to the investigation of the potential solution. In contribution to the existing research, this paper is to shed light on the impact of shadowing technique with the aid of spoken text features by Google Text-to-Speech on removing learner's flat tone as well as achieving basic English intonation in text, provided that the tool is adopted intensively throughout a pre-designed training course. In the study, a pretest-posttest method is employed in one same sample, with the pre-scheduled experimental period being the control group and post-training being the treatment group. After ten weeks of intensive training program following a detailed syllabus, the posttest results, which are computerized using Speech Analyzer, indicates that the participants benefit from the training in terms of intonation in the text as there is a positive difference in scores achieved by the treatment group, benchmarked against the control group. However, due to the rather small size of the population, the study failed to generalize its findings. The implementation of spoken texts in Google Text-to-Speech tool and Speech Analyzer software will be further discussed in this study.

Keywords: Intonation in text, default tone, Google Text-to-Speech, text-to-speech, shadowing techniques

1. Introduction

It is indisputable that the English language has become a lingua franca with globally widespread use. The demands for language learners, thus, have increased accordingly. Besides mastering grammatical structures and patterns as well as conquering a wide range of lexical items, learners are now required to learn how to use a language in their own way. Together with other features of the English language that form productive competence like speaking, intonation starts to be considered personal prominence. Assuredly, intonation is deemed one of the most crucial attributes a child perceives at the beginning of his first language (Cruttenden, 1997; Crystal, 1986; Lieberman, 1986; Mehler *et al.*, 1988; Snow & Balog, 2002). Unlike Vietnamese, Mandarin, Thai or Japanese, which deal with prosodic characteristics of lexical tones, the

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English language uses tone partly as a medium of intonation to convey information. In terms of English language use, the tonal choices of individual words or sentences do not alter the lexical meaning of sentences but their non-lexical meaning (Wells, 2006). As a matter of fact, the English intonation system poses a number of complicated issues to its users, yet it plays a pivotal role in the language's prosody. For other branches of pronunciation, such as phonetically pronouncing an individual sound or word, the drill method, which requires students to say the words aloud repeatedly, seems effective. However, it is virtually unreasonable to expect that the ability to intone properly can be shaped using a similar approach, for intonation involves the speaker's feeling at the moment the utterance is produced.

Recently, prosodic characteristics of intonation have drawn great attention from academia to look for possible solutions to the problem mentioned above. In contribution to the existing research, this paper is to shed light on the impact of shadowing technique with the aid of spoken text features by Google Translation tool, particularly Google Text-to-Speech, on removing learners' inappropriate use of English intonation, provided that the tool is adopted intensively throughout a pre-designed training course. In the study, a pretest-posttest method is employed in one same sample, with the pre-scheduled experimental period being the control group and post-training being the treatment group. After six weeks of intensive training program following a detailed syllabus, the posttest results, which are computerized using Speech Analyzer, indicates that the participants benefit from the training in terms of intonation in the text as there is a positive difference in scores achieved by the treatment group, benchmarked against the control group. Besides, the implementation of spoken texts in Google Translation tool and Speech Analyzer software will be further discussed in this study.

2. Literature review

2.1. Defining key terms:

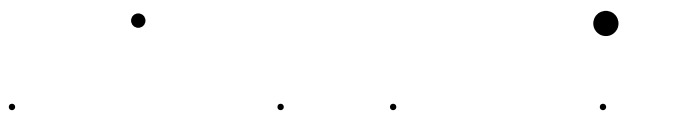
2.1.1. intonation:

In this paper, intonation is strikingly marked as the rhythm of speech that effectively supports the organization and transmission of messages. It is also one of the most broadly used aspects of suprasegmental phenomena which has a huge impact on verbal languages - notably the English language system. Intonation carries not only grammatical concepts but also syntactic and pragmatic meanings. With that being said, it is reasonable to state that language learners who made greater efforts in learning and exploiting intonation in their learning have higher proficiency in English (Wennerstorm, 1998). Aside from learning how to master the incredibly precise pronunciation of discrete words or sentences, learners' awareness and concerns about other prosodic features such as intonation should receive more attention from those in charge of L2 teaching and training. As a matter of fact, it would be much better if the students themselves were provided with proper intonation training. In Lin, Fan, and Chen's views (1995), English learners tend to pay greater attention to pronunciation or lexical items such as vocabulary and grammatical structures than intonation and rhythm when listening to English. This explains why most of them struggle to catch up with the speed of the listening tapes. According to Gilbert (1994), tone and its features enable learners to follow the flow of information in spoken English. For Piekering (2004) and Wennerstomi (2004; 1998), a non-native speaker’s English will be deemed more comprehensible by receivers if the user can employ proper intonation structures.

Mainly, English language intonation is generally classified into three systems of hierarchy: tonality, tonicity and tone (3Ts) (Wells, 2006). Respectively, tonality can be referred to as the position at which speakers choose to cut their utterances into chunks. Appropriate intonation patterns should be applied to each chunk. Those chunks are widely known under the names like the intonation of word group, tone group or intonation phrases - so-called IPs. Considered the next hierarchical matter, tonicity is a term showing that language users highlight the most crucial words they desire to express (Wells, 2006). These accented words are expected to receive much attention from the hearers. More often than not, the speakers accent the main stressed syllable of the word to be more accurate. At the time, they shift the pitch movement by rising from low to high tones. This is to say, the last matter in 3Ts happens to be born - tone. Particularly, the last and the most important accent in IP is called the nucleus. The tone is defined and decided when the speaker locates the nucleus in terms of pitch. The tone of sentences is closely associated with the type of pitch movement placed.

Basically, the most fundamental distinctions of nucleus tones are falling, rising, and falling-rising tones. In this study, the three tones are again generalized into falls and non-fall since falling tones, and their variations are varied and rather vague (Wells, 2006). In falling-toned sentences, the tails fall lower than its nucleus and rising-toned sentences with that in vice versa.

(fall) I think it was funny.



Nucleus|tail

(rise) Was it funny?

Nucleus|tail

In the two examples, the syllables *-fun-* are treated as the nucleuses which are accented strongly with appropriate timing, and the syllables *-ny-* are tails. The tail in *(fall)* examples goes lower than its nucleus compared to that of *(rise)* example. Therefore, *(fall)* example is determined as falling tone and *(rise)* example is defined as rising tone. In this paper, the research team principally pays huge attention to default tones that are relatively associated with the notion of tones regarding each type of sentence. Our target participants are non-English majors who have loose English backgrounds and no attachment to the language. As generalized, default tones can be:

- a fall as in sentence types such as statements, commands and wh-questions, exclamations;

- a rise as in questions requiring confirmation such as yes-no questions;

Apart from that, another generalization of default tones involves the notions of utterances. The default can be:

- a fall if it displays the main part of the utterance, and
- a fall-rise/rise (non-fall) if it displays a subordinate or dependent clause.

2.1.2. Google Text-to-Speech (GTTS)

Google Text-to-Speech (GTTS) with WaveNet occurred as a momentous development of speech synthesis technology.

Google Text-to-Speech (GTTS) is an application of screen reader used for the Android operating system, powered by Google. It enables apps to read out loud the texts appearing on the screen in a variety of languages. Apps such as Google Play Books for using machined voices to read books aloud, Google Translate for voicing out loud translations with precise pronunciation and human-like intonation, and many other applications which command ascended Artificial Intelligence (AI) technologies.

WaveNet, a software developed by Google's UK-based AI firm DeepMind, belonging to Google since 2014 due to Google's acquisition, generates Google Cloud Text-to-Speech. The system makes an effort to set itself apart from Amazon and Microsoft. DeepMind's AI speech synthesis technology is notable for its realistically sophisticated naturalness. Concatenative synthesis is used by most speech synthesizers (including one of the most powerful AI apps - Apple's Siri), where a program saves individual phonemes and subsequently puts them together to produce words, phrases, or sentences. WaveNet, on the other hand, generates speech via machine learning. It then reconstructs waveforms from a database of the human voice with a rate of up to 24,000 samples a second. Google Text-to-Speech has successfully exploited new technology - speech synthesis- to the full.

A variety of voices and languages supports GTTS.

GTTS is provided with a wide range of voices, including both standard and WaveNet voices. WaveNet voices, specifically, are examined for higher quality voices.

Language	Voice type	Language code	Voice name	SSML Gender	Sample
Afrikaans (South Africa)	Standard	af-ZA	af-ZA-Standard-A	FEMALE	0:00
Arabic	Standard	ar-XA	ar-XA-Standard-A	FEMALE	0:00
Arabic	Standard	ar-XA	ar-XA-Standard-B	MALE	0:00
Arabic	Standard	ar-XA	ar-XA-Standard-C	MALE	0:00
Arabic	Standard	ar-XA	ar-XA-Standard-D	FEMALE	0:00
Arabic	WaveNet	ar-XA	ar-XA-Wavenet-A	FEMALE	0:00
Arabic	WaveNet	ar-XA	ar-XA-Wavenet-B	MALE	0:00

Particularly, WaveNet voice implemented in Google Translate - Google Text-to-Speech is coded:

Language	**Voice type**	**Language code**	**Voice name**	**SSML Gender**
English (US)	WaveNet	en-US	en-US-Wavenet-G	FEMALE

GTTS is believed to be the highest achiever on the Mean Opinion Score (MOS) scale.

This bar chart below indicates that WaveNet voices in US English and Mandarin Chinese are significantly more outweighed compared to other synthetic voices and human speech. The y-axis values show raters' Mean Opinion Score (MOS). On a scale of 1 to 5, test raters evaluated each voice based on how much it was almost like natural human talk. (Google, 2013)

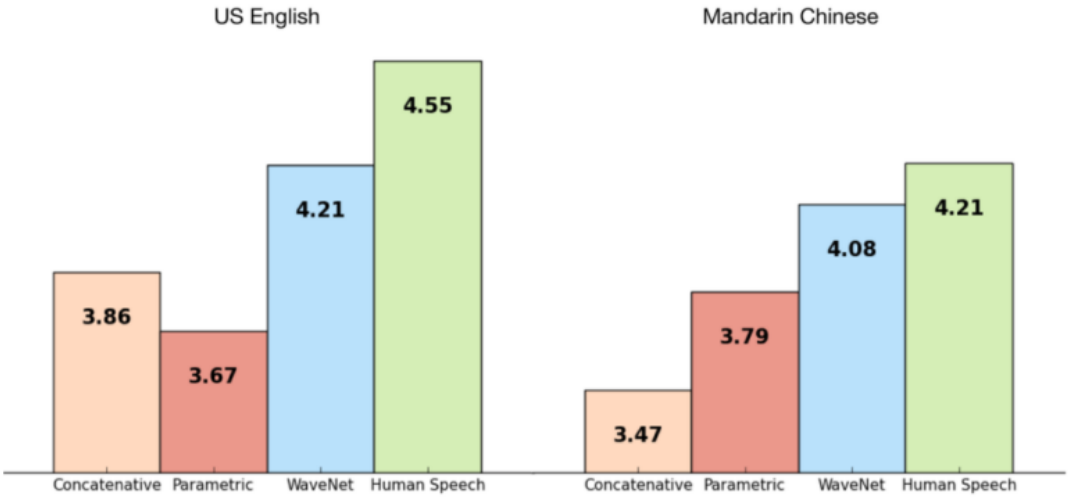


Figure 1. Comparison between US English and Mandarin Chinese using WaveNet voices, other speech synthesis and human speech.

WaveNet produces more natural-sounding voices than previous text-to-speech model systems. Its synthesized voices are based upon levels of phonemes, syllables, and words which shadow human-like emphasis and inflection. In 2016, Oord, Dieleman, Zen, Simonyan, Vinyals, Graves., ... & Kavukcuoglu, K. proved the effectiveness and the degree of naturalness of WaveNet voices via their paper. The researchers conducted three experiments in total, including Multi-Speaker Speech Generation (MSSG), Text-to-Speech (TTS), and Music (M) in order to give clear evidence and significant statistics. Among others, it is rather obvious to view from *Table 1* that TTS from WaveNet occurred to be greater outperformed the two models which were first from Gonzalvo et al. (2016) - hidden Markov model (HMM) and the other was from Zen et al. (2016) - long short-term memory recurrent neural network (LSTM-RNN). WaveNet voices reached *4.21* for North American English and *4.08* for Mandarin Chinese on the 5-point MOS scale for its naturalness, which proved the undeniable significance. They were considered the surprisingly highest point ever achieved. WaveNet considerably improved the prior state of the art, narrowing down the distance between human-like speech and the best previous synthesized speech model by up to 50%.

Table 1 *The MOS test results are shown from the test.*

	Subjective 5-scale MOS in naturalness	
Speech samples	North American English	Mandarin Chinese
LSTM-RNN parametric	3.67 ± 0.098	3.79 ± 0.084
HMM-driven concatenative	3.86 ± 0.137	3.47 ± 0.108
WaveNet (L+F)	$\mathbf{4.21} \pm 0.081$	$\mathbf{4.08} \pm 0.085$
Natural (8-bit μ-law)	4.46 ± 0.067	4.25 ± 0.082
Natural (16-bit linear PCM)	4.55 ± 0.075	4.21 ± 0.071

2.1.3. Shadow-reading technique

Intonation should be substantially put into consideration to teach at the discourse genres, according to Levis (2002; 2004) and Jenkins (2004). Shadowing, along with mirroring,

repetition, and imitation approaches (Goodwin 2004), is one of the most effective oral teaching methodologies applied for copying intonation of native speakers, according to Celce-Murcia et al. (1996). In practical application, the shadowing technique is commonly employed in Simultaneous Interpretation training (SI). Before starting SI training sections, the participants must engage in extensive shadowing practices to grasp the rhythm Shadowing Technique in English Intonation Instruction and prosodic elements in actual speech. The fundamental skill set of shadowing is to closely follow the utterances of Native Speakers (NSs) (Luo, Yamauchi & Minematsu, 2010).

In this paper, a pedagogical method called shadow-reading technique, adapted from Murphey's (2001a) - deemed to be 'conversational shadowing', predominantly became our central instruction. The pedagogical method helps to strike into a complicated yet customary phenomenon in discourse matters regarding people's silent or aloud repetition of what they hear from their interlocutors. Shadowing, from 1992, has been identified as an effective tool for training interpreters (Kurz, 1992; Sabatini, 2000) and for assessing skills in the language process, particularly for listening and reading skills, to majority scholars (Kurz, 1992; Sabatini, 2000). (Gray, 1975; Jordan, 1988; Marslen-Wilson, 1975; Muchisky, 1983).

Murphey (2001a) advocated for the use of conversational shadowing in classroom research, a practice in which students not only repeat, partially or totally, what other students say but also respond dialogically. Summarizing as a means of shadowing lengthy spans of conversation is also recommended by Murphey (2001a). Therefore, there are two formations of shadowing: shadowing and summarizing. According to Murphey (1996, 2001a), Shadowing may be useful in demonstrating to learners how to make negotiations in a way that facilitates L2. As indicated by Gal'perin (1969) approach to the development of mental processes, interactive shadowing and summarizing appear to be excellent for external (audio) verbalization. Shadowing and summarizing have been demonstrated to be useful in boosting L2 learners' listening and speaking abilities in empirical studies (Tabata, 2002; Tamai, 2001). With that being said, shadowing itself became our exclusive method option to implement in our online training. Vygotsky's (1986) idea of imitation has been shown to be in agreement with James M. Baldwin's (Lantolf & Thorne, 2006), particularly the form of imitation he called persistent imitation. Simple imitation, which Baldwin (1894, 1895/1906) defined as an involuntary, results in a more or less close copy of the original and does not involve consciousness of what has been done, and persistent imitation, on the other hand, is a type of purposeful, intentionally cognitive activity that involves making multiple tries to duplicate a model, each time in an attempt to improve the reproduction using an image of the original model and the imitator's past attempts as a guide. Therefore, persistent imitation is more cyclically, purposefully transformative in nature and optioned as a more narrowed scope of the study.

It is apparent that imitation does not imply mindless mimicry or repetition. Imitation entails recognizing the means to achieve the activity's goal (end, purpose, or result) and understanding the objective's aim (end, purpose, or result). Linguistic imitation, in particular, necessitates both awareness of the communication goals and the tendency to generate language. Rather, it is the endeavor of children to recreate the language that adults produce with the same communication function, according to Tomasello (2002). Two important factors govern linguistic imitation: entrenchment and pre-emption (Tomasello, 2003). Learners get habituated to producing language solely in ways that are comparable to those generated by professional speakers around

them through entrenchment, which is achieved by frequent exposure to linguistic models and successful use.

2.2. Previous studies

There is increasing demand in learning global languages in this interconnected world, and English has long taken the lead amongst other languages. Language, by far, is one of the primary factors that function as a bridge to bring worldwide nations closer, which means a great deal in terms of both economic and social aspects (Tran & Nguyen, 2018, as cited in Luu et al., 2021). As far as language acquisition is concerned, EFL learners are expected to master all four skills to be verified as proficient language users. Henceforth, the standardized English language syllabus used in Vietnam has long been dominated by the teaching of grammar and reading comprehension while the speaking skill was hardly paid any attention to, which resulted in learners not being able to communicate in a real-time context properly. Pronunciation and intonation were therefore also excluded as part of the national syllabus for the foreign language program for ages before they started to captivate attention from Vietnamese researchers and educators roughly two decades ago. Since then, with the advancement of technologies, and recently, the outbreak of the Covid-19 pandemic, learners all over the world have been subjected to virtual learning. Though met with a barrage of criticism, online learning, assisted by up-to-date media, presents a "*strong potential to enhance language skills for learners and promote the process of learning English*" (2021, Van et al., as cited in Pham, 2021), and a vast variety of research into this particular area has got an opportunity to expand further.

In 2011, Ngo published a study featuring adopting an intonation teaching approach that involved individual language learning strategies (LLS). The training model allowed learners to decide on the strategy that best suited them, and it was shown to work well in combination with other teaching and learning techniques employed throughout the training course, such as written reports, field notes, group discussions and interviews. As a result, the study generally revealed improvement in the ability of Vietnamese learners of English to perceive two features of English intonation: tonicity and tone after the training course. Within the same year, Tran (2011) also suggested that the teaching of intonation in which students are entitled to experiencing real English rhythmic patterns and melody yielded a better result on students' performance of intonation compared to those who were only provided with theoretical knowledge concerning intonation. Most of these studies, despite particular differences in their approaches, revealed a positive outcome for certain implications on teaching and acquiring pronunciation/ intonation. Students' interest was successfully aroused as they were allowed to have a more hands-on experience in their training and really get engaged in the world of melody with diverse prosodic features, which proves absolutely crucial in any pronunciation training. However, regardless of the observable merits, it goes without saying that those teaching methods not only take a large amount of time but also demand close monitoring of the trainer. Thus, whether it would present a mismatch between what the research team thinks is possible and what can actually be achieved after an intonation training course remains questionable.

Studies on shadowing technique & intonation

In the era of the Audio-Lingual method, shadowing was considered one of the most relevant techniques to use in teaching speaking and listening, and so far, it still proves to be an effective tool in pronunciation training (Лобачова, 2020). In fact, practically speaking, of all the techniques prevalently implemented in intonation training, shadowing is gaining greater

support than ever and contributing considerably to the second language teaching as well as acquisition. However, it is rather surprising that back in the early 2000s, little research could be observed on the implementation of shadowing in teaching speaking, with pronunciation and intonation included (Hamada, 2018). Despite its own failure to maintain researchers' interest over the last two decades, shadowing technique is currently intensively delved into and manifests itself in an abundance of research schemes into the field of intonation training worldwide. Up to the present, most of the works aiming at measuring the effectiveness of teaching experiments using shadowing technique have revealed a positive impact on students' performance in receptive and productive skills such as listening, speaking and reading (Hamada, 2016; Nakanishi & Ueda, 2011; Hsieh, Dong, & Wang, 2013). The prosperity of research into the importance of shadowing for English language teaching is rather obvious, but then, there are few studies that examine the influence of this particular technique on pronunciation in general and intonation to be more specific. In addition, despite the fact that different training approaches were taken into detailed consideration and all proved fruitful to some extent, they tend to involve great effort and require teachers to have a profound understanding of prosodic features and intonation-related concepts. Nonetheless, it is not ideal in Vietnam, especially when most teachers lack the confidence to conduct pronunciation/intonation lessons.

2.3. The current study

The teaching of intonation has been neglected for a long time for numerous reasons (Ngo, 2011). Research by Graham & Post (2018) suggested that together with other aspects, the L2 competency of a second language learner was also represented in the way they deal with intonation while speaking. However, in spite of its importance, there has been no course devoted to teaching intonation at any language institutions in Vietnam, along with the fact that the amount of time allocated for teaching intonation in the course syllabus is not specified, and even if any, the amount remains minimal and often skipped by the teachers as intonation training section is, more often than not, considered optional. This is true for all levels of public education in Vietnam, from primary schools to tertiary institutions, and the significance of intonation training seems to be overlooked at present time though several reformations regarding second language teaching have already taken place throughout the course of history. As intonation is not presented as part of the national syllabus of English subjects, it is not legally included in any kinds of testing or assessment of English language proficiency issued by the Vietnamese Ministry of Education and Training. This necessarily presents an urge to rethink the problem, raising teachers' awareness of the fact that intonation training should not be undervalued under any circumstances and coming up with in-time strategies to compensate for the ever-gloomy scenario of intonation teaching in Vietnam.

The lack of research into intonation training that takes into account the Vietnamese educational settings could be attributed to numerous factors, among which stands out two significant ones that, as the research team believes, can be properly addressed within the scope of this study. First, the lack of confidence and understanding of intonation amongst Vietnamese teachers of English remains quite a prevalent issue (Ngo & Setter, 2011). Second, intonation, like other language areas, requires learners to have constant exposure to it by listening to modal recordings as well as practicing using appropriate intonation on a regular basis in order to be familiarized with intonation. Also, assessing students’ progress in their performance can even present itself as a major concern for those in charge of teaching intonation. The question pops up right here: in a circumstance in which intonation training is generally undervalued,

represented by the fact that no course has ever been specifically designed for reinforcing students' perception of intonation, and economic factors constantly prevent a large number of Vietnamese learners from accessing proper training, what should be done to address the problem? At this point, it is worth remembering that the world has entered the greatest digital reformation, and the options for any kind of learning should be numerous. Zeitoun (2008, as cited in Nguyen, 2021), classified online learning into two different types: *synchronous* and *asynchronous* mode. The former is typically conducted via a video-conferencing room, which allows learners to interact intensively with their instructors and receive different kinds of feedback, either impromptu or official, while the latter offers students access to a wide range of sources with already prepared lessons, and they can keep track of their own learning pace. Regarding intonation training, the advent of applications assisting the acquisition of pronunciation, ELSA speak, Voki, and Puppet Pals, to name but a few, has proved its great contribution to improving the situation (Samad and Ismail, 2020). However, most of them are not free of charge or have a free basic version which merely provides learners with limited access to their features and resources. By now, the option should be clear – the research team is seeking a tool or website assisting intonation practice that (1) possesses a wide range of resources of oral records and database to serve the purposes, (2) fully requires little competency from the teachers and (3), most importantly, easily accessed with permanent free of charge policy. After researching intensively, GTTS seemed to be a potential candidate and was taken into account as the primary tool adopted in this experimental study. Specifically, GTTS operates on a massive volume of worldwide language data, with prosody information (i.e., rhythm and melody) included, and the voice assistant embedded in the website is totally eligible for a pronunciation/intonation learning tool. Besides, GTTS, which is embedded within Google Translate, is a cost-free and readily available service, with a new model introduced recently that enables users to use the app everywhere, no matter whether there is an internet connection or not ("About - Google Translate", 2017). These features make GTTS a preferred tool for our intonation training scheme. Basically, the study aims at measuring the effects of the shadowing technique aided by GTTS on EFL students' performance of intonation in-text throughout a pre-designed training course.

2.4. Research questions

The aims of this study can be addressed through the following research questions:

1. Do the students use default intonation in text correctly before the online training course?
2. To what extent do the students improve their performance of default intonation in text after the online training course?

3. Methods

3.1. Pedagogical setting and participants

The participants in the study were university students ranging from first to the third year who have little to no knowledge of English intonation in text. At the time of the research, these students were studying at two universities in Ho Chi Minh City (abbreviated to HCMC), Vietnam, namely the HCMC University of Technology and the HCMC University of Education. Both convenience sampling and snowball sampling were employed for the distribution of the questionnaire. First, the research team posted an online questionnaire via

Google Forms on the Facebook pages of the two universities mentioned previously, which received a total of 172 responses. The respondents, then, were kindly requested to invite their classmates and friends to fill in the form. Hence a snowball sampling started, which gathered ten more participants in the process. The responses were then checked manually to opt out of those who had more competency in English intonation needed for the study. In total, 18 valid responses were recorded. Due to the adversity of the raging Covid-19 pandemic, the size of the participants was then shrunk to only 7. This represented a great difficulty for the research team in finding a sufficient number of available participants to take part in the online training course. Despite the very limited sample given, the research team believes that this study's findings should provide a starting point for further in-depth research on the same area of interest.

3.2. Design of the study

The study was conducted using both quantitative and qualitative components. A pretest/posttest design was used to measure the effects of a 10-week online training course (ten 90-minute sessions on the Zoom online meeting platform) on English default intonation. The online course only took place in only 10 weeks since it occurred during the start of the participants' new school year. Periods longer than 10 weeks would have been problematic for the participants' schedules. The course syllabus mainly focused on the default intonation of five types of sentences, namely *Statement*, *Exclamation*, *Yes-no question*, *Wh-question*, and *Tag question*. Although the course included all types of default intonation in text, the research team only elaborated on falling and rising intonation as the study's aim. The course allowed the saving of the audio files, which facilitated the contrast between the prosodic patterns produced by the participants and that of the spoken texts provided by GTTS. These files were then analyzed using Speech Analyzer software to provide auditory and visual displays of pitch contours as feedback and assessment. The software, hence, served as a tool for the interpretation of the study's findings. The training course syllabus followed a framework of shadowing instruction and structured input activities (Wells, 2006) in combination with GTTS. The input activities focused on helping the participants to recognize and reproduce some important patterns of English default intonation in text. The course also included explicit information about the patterns and their meaning in terms of text and basic conversation (Wells, 2006).

3.3. Data collection and analysis

The pretest (see Appendix 1) consisted of the first recording of the participants' short sentences prior to receiving any target knowledge of English default intonation in text. The test required the students to create separate recordings of 6 sentences, including 2 *statements*, 1 *exclamation*, 1 *yes-no question*, 1 *wh-question*, and 1 *tag question*. The results taken from the pretest will facilitate the course syllabus as they will provide the research team with a preliminary assessment of the participants' appropriate use of English default intonation in text. The researcher compiled notes on the sessions and the learners' comments and reactions during the training course. The participants' progress was also recorded for analysis and feedback throughout the course. At the end of the online training course, the posttest consisted of the participants' perception of default intonation in the text as well as the last version of short sentences produced and recorded by them. In terms of the recording questions, the students were asked to create separate recordings of 9 sentences, including 2 *statements*, 1 *exclamation*, 3 *yes-no questions*, 1 *wh-question*, and 2 *tag questions*. Each participant completed an anonymous questionnaire on the value of the online intonation training course received within the post-test.

Finally, using the Speech Analyzer software, each of the participants' recordings in the posttest was assessed by comparing their prosodic patterns with those produced by GTTS. Each of the recordings was assessed by the three members of the research team to make sure that the assessment was done coherently and appropriately. Then, each member gave their own comments on the degree of intelligibility of the participants' prosodic performance. After that, the research team provided feedback for the participants' performance.

4. Results, Findings and discussion

4.1. Results and interpretation

As previously mentioned, participants were asked to do a pre-designed test on their ability to use proper intonation for different types of English sentences prior to the training course. It is rather surprising to observe that the students managed to use appropriate falling intonation while the rising tone seemed to pose a real challenge to their perception (1).

After the training course, students' performance in intonation was assessed via another test whose results then, indicated an improvement in rising intonation. By contrast, it is noticed that their use of falling tone hardly improved. This trend can be presented in the charts as below:

STATEMENT (FALLING INTONATION AS DEFAULT)

Table 4.1 Frequency description of students' pretest default falling intonation performance using Speech Analyzer

PRETEST				
Sentence	**Name**	**Nucleus (Hz)**	**Tail (Hz)**	**Percentage (%)**
1. I **don't** think it is true that she was a**fraid**.	Student A	287	211	73.52
	Student B	307	254	82.74
	Student C	118.7	105.9	89.22
	Student D	140.9	66.1	46.91
	Student E	419	243	58.00
	Student F	136	120	88.24
	Student G	294	184	62.59
	Google	296	113.4	38.31

Table 4.2 Frequency description of students' posttest default falling intonation performance using Speech Analyzer

POSTTEST				
Sentence	**Name**	**Nucleus (Hz)**	**Tail (Hz)**	**Percentage (%)**
5. I be**lieve** it is going to rain at the end of the **week**.	Student A	271	210	77.49
	Student B	246	195	79.27
	Student C	139.7	119.8	85.76
	Student D	137.8	122.8	89.11
	Student E	294	214	72.79
	Student F	375	68.8	18.35
	Student G	280	176	62.86
	Google	297	122.8	41.35

The tail movement percentage illustrates whether the sentence is uttered with falling or rising intonation. A value below 100% points to a fall in intonation, while one exceeding 100% indicates a rise in the speaker's speech.

The table is intended to record the figures for *statements*. Obviously, tail movement percentage values generated by the speech of all students manifest themselves below 100%, so all those taking the test used proper falling intonation for this sentence type in both pretest and posttest. That means the learners generally did not struggle with the falling intonation, and there is also no significant improvement in learners' perception of this prosodic feature.

YES-NO QUESTIONS (RISING INTONATION AS DEFAULT)

Table 4.3 Frequency description of students' pretest default rising intonation performance using Speech Analyzer

PRETEST				
Sentence	**Name**	**Nucleus (Hz)**	**Tail (Hz)**	**Percentage (%)**
2. Is it true that you **faked** your way in **here**?	Student A	344	283	82.27
	Student B	357	287	80.39
	Student C	111	106.4	95.86
	Student D	64.9	229	352.85
	Student E	247	457	185.02
	Student F	160	139	86.88
	Student G	406	234	57.64
	Google	237	286	120.68

Table 4.4 Frequency description of students' posttest default rising intonation performance using Speech Analyzer

POSTTEST				
Sentence	**Name**	**Nucleus (Hz)**	**Tail (Hz)**	**Percentage (%)**
1. Are **you** seri**ous**?	Student A	331	355	107.25
	Student B	246	260	105.69
	Student C	129.9	231	177.83
	Student D	127.8	227	177.62
	Student E	237	376	158.65
	Student F	146.9	185	125.94
	Student G	227	228	100.44
	Google	267	287	107.49

The research team attempted to calculate the variation percentage concerning Yes-No questions brought about by both the pretest and the posttest. According to Wells (2006), the default intonation of Yes-No question is a rise.

As to the pretest, most figures are below 100%, which points to a fall in the participants' speech. This is deemed inappropriate as the participants were required to record the yes-no question given using proper default intonation, i.e., a rise. Meanwhile, the above-100% percentages shown in the posttest suggest that the learners successfully used the correct rising intonation as default.

At this point, it would be better to delve into the dilemma in greater depth. The fact that learners barely improve their intonation when it comes to a fall can be attributed to two main reasons. First, Vietnamese intonation does not embed and operate on semantic meaning but lexical meaning, which features the rise or fall based merely on the tonal systems with the combination of 6 fundamental tones. That should explain why Vietnamese do not have a tendency to lower their tone when asserting discourse-level definiteness and certainty. Secondly, according to Wichmann (2014), when learners are trained properly and their awareness is deliberately activated, they tend to improve rising more than falling intonation. Theoretically, the rising tone is easier to recognize.

To exemplify (1), students' intonation performance in 3 sentences corresponding to two types of intonation - rising and falling - will be placed under thorough scrutiny. The measurement of improvement follows the rating criteria below (table 4.5):

Table 4.5 Improvement Scale

Score	Rating	Definition
1	Worse	No improvement
2	Mildly improved	< 25% improvement
3	Improved	25-49% improvement
4	Much improved	50-74% improvement

The table above is adapted from the Subject Global Aesthetic Improvement Scale (2019). It is used to measure and interpret the difference between the mean baseline and mean follow-up grades of the participants' prosodic patterns.

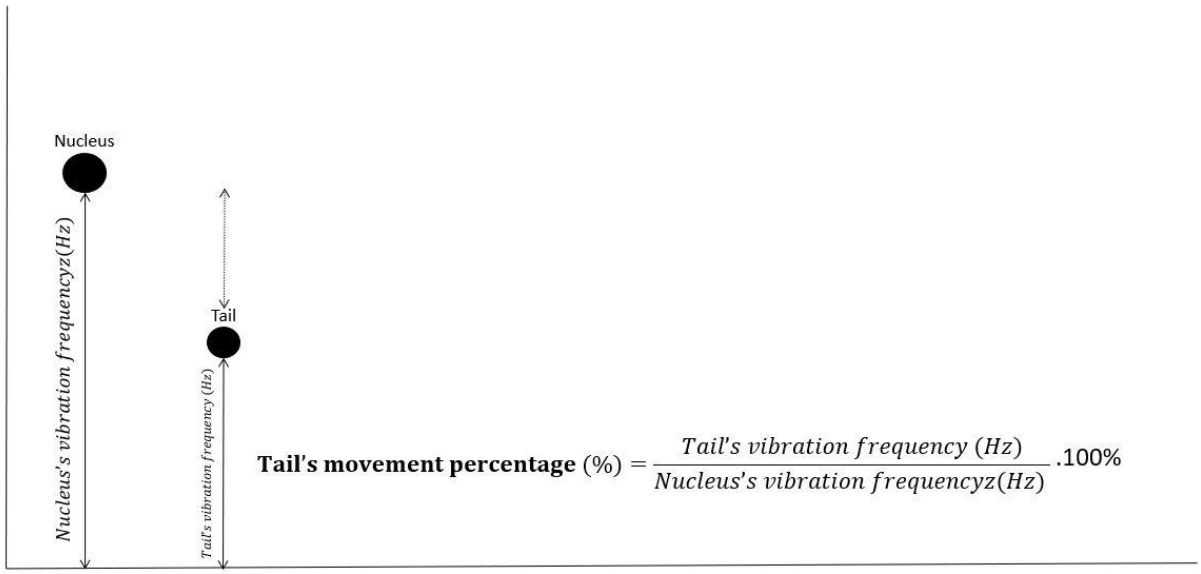


Figure 4.6 Tail movement description

$$\text{Improvement (\%)} = |(L_{Post} - G_{Post}) - (L_{Pre} - G_{Pre})|$$

***Note**: L = Learner's tail movement percentage in specific sentence type*

G = GTTS tail movement percentage in specific sentence type

(L_{Post} - G_{Post}) = percentage of the difference between learner's performance of falling/rising tones and GTTS' performance on falling/rising tones in POSTTEST

(L_{Pre} - G_{Pre}) = percentage of the difference between learner's performance of falling/rising tones and GTTS' performance on falling/rising tones in PRETEST

This formula is applied to the analysis of the participants' improvement in all types of sentences, which will be elaborated as follows:

● Default falling intonation 1 (Statement)

Table 4.7 The improvement of the participants' default falling intonation

Sentence type	Name	PRETEST	POSTTEST	Improvement (%)
		Tail movement percentage (%)	Tail movement percentage (%)	
Statement	Student A	73.52	77.49	0.94
	Student B	82.74	79.27	6.50
	Student C	89.22	85.76	6.50
	Student D	46.91	89.11	39.17
	Student E	58.00	72.79	11.76
	Student F	88.24	18.35	72.92
	Student G	62.59	62.86	2.76
	Google	38.31	41.35	

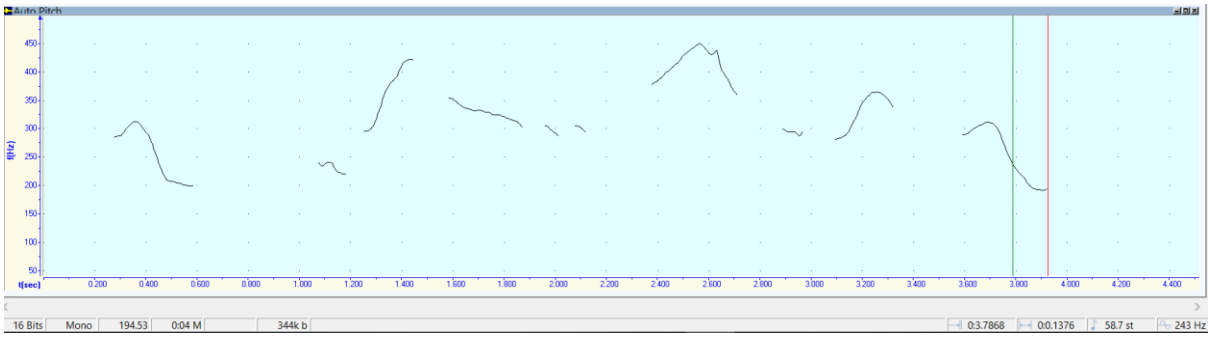


Figure 4.7a Student E's PRETEST performance of a Statement

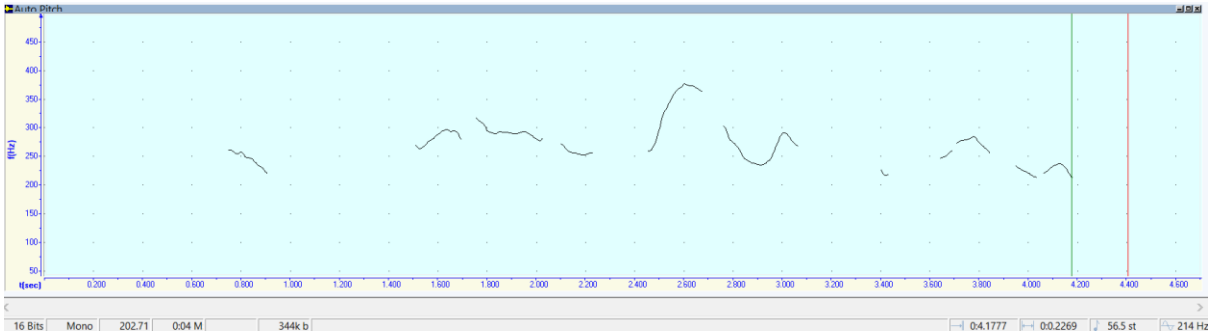


Figure 4.7b Student E's POSTTEST performance of a Statement

As depicted by **Table 4.7**, **Figures 4.7a** and **4.7b**, there is a slight overall improvement regarding the participants' default falling intonation in *statements*. Specifically, while one student shows a significant improvement of 72.92% in their default falling intonation and one with a considerable improvement of 39.17%, four others show mild improvement of more than 2%. However, one of them does not show any improvement after the online training course.

● Default falling intonation 2 (Exclamation)

Table 4.8 The improvement of the participants' default falling intonation

Sentence type	**Name**	**PRETEST**	**POSTTEST**	**Improvement (%)**
		Tail movement percentage (%)	**Tail movement percentage (%)**	
Exclamation	Student A	64.14	63.29	5.28
	Student B	149.43	24.93	128.93
	Student C	76.95	32.49	48.89
	Student D	62.25	63.27	3.41
	Student E	64.33	62.21	6.55
	Student F	105.36	29.93	79.86
	Student G	34.88	60.59	21.28
	Google	48.33	52.76	

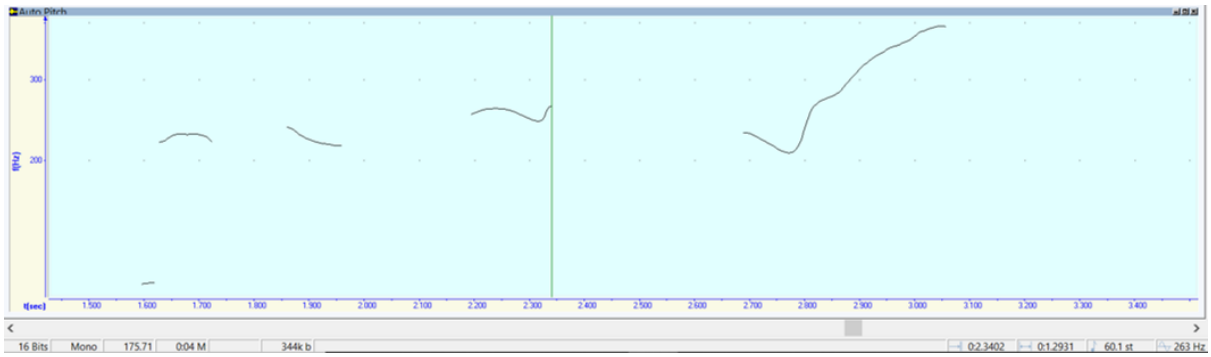


Figure 4.8a Student B's PRETEST performance of an Exclamation

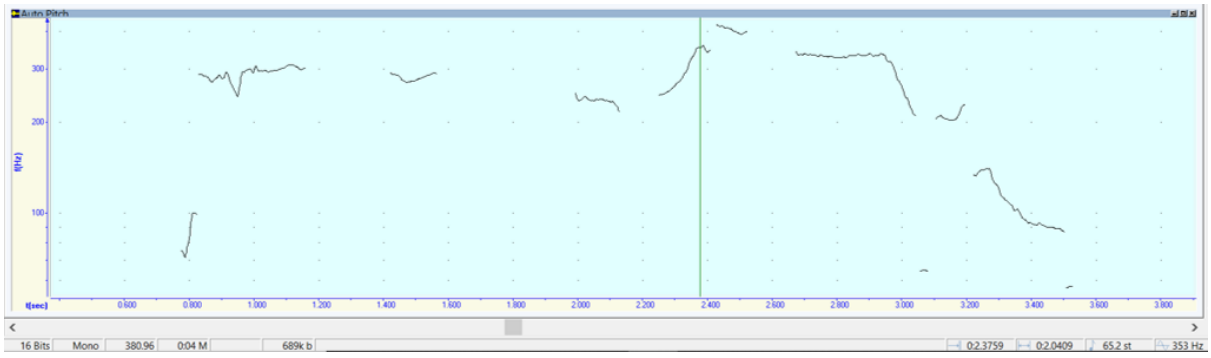


Figure 4.8b Student B's POSTTEST performance of an Exclamation

Table 4.8, **Figures 4.8a** and **4.8b** illustrate an overall mild improvement in the students' default falling intonation in *exclamations*. Two students among the group perform significantly better with 128.93% and 79.86% in the improvement rate. One of which shows a mild improvement of 48.89% in their English default falling intonation. The remaining four students show a slight improvement of more than 3% in their intonation performance.

● Default rising intonation 2 (Yes-No question)

Table 4.9 The improvement of the participants' default rising intonation

Sentence type	Name	PRETEST	POSTTEST	Improvement (%)
		Tail movement percentage (%)	Tail movement percentage (%)	
Yes-No question	Student A	82.27	107.25	38.17
	Student B	80.39	105.69	38.48
	Student C	95.86	177.83	95.16
	Student D	352.85	177.62	162.04
	Student E	185.02	158.65	13.19
	Student F	86.88	125.94	52.25
	Student G	57.64	100.44	55.99
	Google	120.68	107.49	

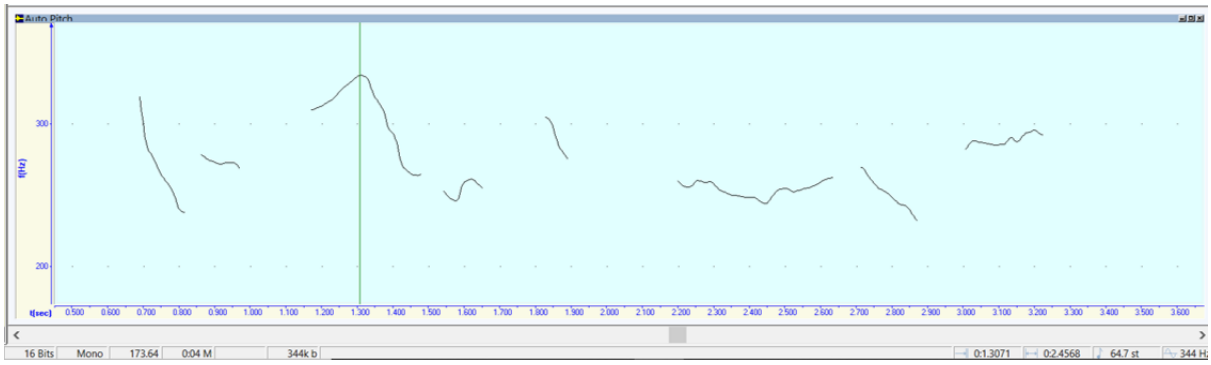


Figure 4.9a Student A's PRETEST performance of a Yes-No question

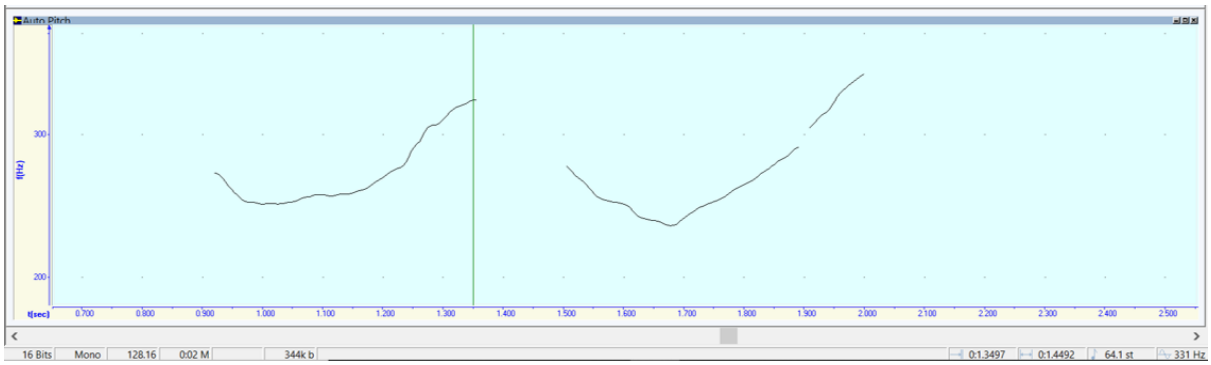


Figure 4.9b Student A's POSTTEST performance of a Yes-No question

According to **Table 4.9**, **Figures 4.9a** and **4.9b**, the students show an overall significant improvement regarding the participants' default rising intonation in *Yes-no questions*. In particular, one student performs 162.04% better in the posttest than in the pretest, which is a significant improvement. Three other students show considerable improvement of more than 50%, while the three remaining show mild improvement of more than 10%.

Addressing the first research questions posed from the beginning of this paper, it is evident that, in the pretest, the students performed relatively well in sentences that required falling intonation while they seemed to struggle with rising intonation. For the second question, the results suggest that the participants made significant progress in their use of rising intonation, whereas their performance in falling intonation hardly improved after the training course.

4.2. Merits of the study

Despite only a small number of learners taking part in the study, the research team is able to demonstrate a relatively positive result obtained by an alternative to costly tools and time-consuming approaches to teaching intonation. With the tool supported by Google and the framework clearly presented in the coursebook, it is reasonable to expect that teachers will be less likely to suffer from hard work and the fear of their own ignorance of the prosodic word. In addition, with the aid of the widely-available Google Text-to-Speech system, learning does not necessarily occur at school, which addresses a long-standing problem that no specific time is assigned to intonation teaching at school currently. Last but not least, the idea of taking Google Text-to-Speech as a model to imitate provides students with a purpose to learn. Indeed, 85% of those participating in the project reported that they felt a sense of achievement as they managed to imitate exactly what the machine said.

As claimed in the first place, the study delves into a new approach to intonation training, which is believed to benefit EFL teachers and learners in various ways. The vast availability of GTTS grants teachers easy access to one of the most highly approved AI applications in the modern world, with a huge authentic linguistic database. There is little syllabus time as well as few financial challenges involved, as the practice of intonation is not only refrained in the classroom setting, and users are not required to make registration or process any problematic installation. This study also successfully reveals a positive influence of the combination of GTTS and shadowing technique on learners' performance in intonation, especially when it comes to rising tone.

5. Conclusion

All in all, although the study succeeds in yielding certain positive results in learners' use of intonation, the small participant size, to a lesser or greater extent, prevents us from reaching any level of generalization for a larger population. Additionally, while the research team finds themselves in a rather fine position to answer the question of whether there is any learners' improvement in terms of intonation use, it presents, so far, an unsolved problem regarding the question of *to what extent*. This necessitates further research into the approach to gain more insight into its possible effects on intonation training and learners' perception of related prosodic features.

Apart from these, it should also be mentioned that the scope of this study does not seem to afford generalization of the result as it is rather small. Right from the onset, the research team encountered a number of difficulties in recruiting the participants. Although the initial questionnaires managed to reach out more than 100 participants, with approximately 70% showing their support when asked if they would like to participate in an online intonation training, only 14 showed up on the first day and the number then dropped down to only 7 towards the end of the training section. This can be attributed to 3 fundamental reasons. First, there is no commitment amongst those taking part in the project, though they were asked to affirm their commitment via a so-called agreement between the learners and the researchers. The fact that no punishment was administered for their one-sided drop might result in the sense of little obligation to the course. Without obvious gain and loss, it is virtually impractical to believe they would adhere to the training as, generally, students are not intrinsically motivated. Second, the course was initiated at the start of an academic year when university students seemed to be fully occupied in preparing for their classwork. Getting engaged in a course with an unforeseeable outcome could prove a waste of time to those already packed with their daily schedule. Another reason is that online learning, despite its particular merits, might seem daunting to a number of learners.

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Biodata

Nhi Le Phuong is currently studying for her Master's degree in Linguistics at Hoa Sen University, HCMC. She fancies researching linguistic fields and teaching methodology.

Linh Vu Hoang Mai is a visiting lecturer at Ton Duc Thang University and Hoa Sen University, Ho Chi Minh City, Vietnam. Currently she is doing a MA degree in Linguistics at Hoa Sen University and finds herself interested in the field of corpus linguistics.

Nhat Tran Minh is a Testing coordinator at the Faculty of Foreign Languages at Hoa Sen University, Ho Chi Minh City, Vietnam. He is currently a Master candidate in Linguistics at Hoa Sen University who is interested in finding feasible teaching methods and applications in the 21st century.

Appendix

Appendix 1: PRETEST

Evaluation of English intonation performance

The following test is used to evaluate your English intonation performance as a means for the research team to design and adjust the online training course in the most effective way.
As there are 6 sentences in the test, please prepare separate recordings for each one. Then, please upload them to the Google Forms accordingly (maximum 10MB per audio file).
Note:
- Please use the type of intonation that you have already known and refrain from referencing external sources for the test so that the research team may gather the most objective evaluation of your performance.
- During recording, please make sure that your surrounding area is relatively quiet with minimum background noises.
- After recording, please make sure that your audio file is clear enough for the listeners to understand.

Full name
.....

Record the below sentences using the intonation that you have already known.
1. I don't think it is true that she was afraid.
2. Is it true that you faked your way in here?
3. Which question is going to make them uncomfortable?
4. Sounds impossible, doesn't it?
5. What a great view!
6. Don't rush or you will fall.

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Appendix 2: POSTTEST

Final Evaluation of English intonation performance

The following test is used to evaluate your final English intonation performance after taking the online training course as a means for the research team to evaluate the effectiveness of the method applied in the training course in improving students' English default intonation performance.

For the theoretical questions, please choose only ONE option or fill in the most appropriate answer that you have learnt.

For the recording question, please prepare separate recordings for each of the 9 given sentences. Then, please upload them to the Google Forms accordingly (maximum 10MB per audio file).

Note:

- Please use the type of intonation that you have already known and refrain from referencing external sources for the test so that the research team may gather the most objective evaluation of your performance.

- During recording, please make sure that your surrounding area is relatively quiet with minimum background noises.

- After recording, please make sure that your audio file is clear enough for the listeners to understand.

Full name

.....

Theoretical questions

Answer the following questions using what you have learnt (please refrain from using external sources during the test).

Question 1: Intonation features:

◯ the change of vocal pitch

◯ the change of prosodic features

◯ the rise of a person's voice to the highest point

Question 2: The use of monotone in reading/speaking indicates:

◯ the overwhelming of emotions which bring many expressions

◯ the lack of confidence

◯ the lack of emotion which makes it dull for the listeners

Question 3: What is the difference between *pitch* and *intonation*?

◯ pitch indicates the change in vocal pitch, intonation indicates the highest/lowest point in a person's voice

◯ pitch indicates the high or low vocal point/degree, intonation indicates the change/changing process of the vocal pitch

◯ pitch and intonation only differs based on perception

Question 4: How many basic types of intonation are there? What are they?

◯ 4 types: Flat tone / Rising tone / Falling tone / Falling-rising tone

◯ 3 types: Rising tone / Falling tone / Falling-rising tone

◯ 3 types: Rising tone / Falling tone / Upspeak tone

Question 5: Default tones should be understood as:

◯ the local dialect

◯ the most used tone for each specific type of sentence

◯ the difference in vocal tone between the male and the female

Question 6: Choose the suitable default tones for the below types of sentences:

	Falling intonation	Rising intonation
Wh-questions	◯	◯
Yes-No questions	◯	◯
Statements	◯	◯
Exclamations	◯	◯

Question 7: In general, rising intonation is used to indicate… / falling intonation is used to indicate... (short answer)

……

Question 8: To indicate uncertainty and doubts in the sentence: "I want to go to that party…, but…", what type of intonation should be used?

◯ Falling intonation

◯ Rising intonation

Question 9: To indicate enthusiasm and excitement in the sentence: "I'm glad to have you here", how would you change your falling intonation? (short answer)

……...

Question 10: The variation in intonation used in tag questions indicates many different layers of meaning. Choose the suitable intonation for the meaning of the sentence: "You've been to London once, haven't you?"

	Falling	Rising
The speaker genuinely wants to ask for information or is doubtful about his/her knowledge.	◯	◯
The speaker already has information and is certain about his/her knowledge.	◯	◯

Record the below sentences using the intonation that you have already known.

1. Are you serious?
2. Who was the girl you were talking to?
3. I don't think it's safe to go there, is it? (the speaker is unsure)
4. He has such a beautiful voice!
5. I believe it is going to rain at the end of the week.
6. Should I hand in my project?
7. I'm going to the park. Would you like to come?
8. He will be late again, isn't he? (the speaker already knows this)

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