Article

JELITA: Journal of English Language Teaching and Literature
Volume 2, Number 1, February 2021, pages 69-94

P-ISSN 2721-1096
E-ISSN 2721-1916

Pedagogical Evaluation and Recommendations on Software Design for English Intonation Learning

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Abstract
Learning prosody with the integration of computer technologies, mainly speech processing, gained interest among Foreign Language (FL) learners and teachers. The present paper aims at (i) evaluating different set of speech technologies that were used by the researcher in English Foreign Language (EFL) classroom during courses of phonetics, and (ii) providing pedagogical suggestions on how to design software for the teaching and learning of English intonation that suits Algerian non-native speakers' needs. The adopted approach is qualitative in nature that employs observation of the pronunciation software based on checklist criteria. The materials include Pronunciation Power, Rosetta stone, Better Accent Tutor, RTPitch, Speech Analyzer, and Praat. In light of this, the results exhibit the pros and cons of each speech program and recommendations are proposed on the criteria to select Computer Assisted Language Learning (CALL) devices for teaching English intonation. The findings revealed that Pronunciation Power and Rosetta stone focus more on the teaching of English segmental over prosodic features except for *Better Accent Tutor* that stresses the learning of intonation. Other speech tools as *Speech Analyzer*, *Praat*, and *RTPitch* provide automatic audio-visual assessment of intonational patterns and measurement of pitch and intensity values. As a result, more focus is to be given to the teaching of discourse intonation and developing materials with the employment of technological tools in order to supplement textbook instructions, and what the teacher and learner should be aware of when teaching and learning English intonation.

Keywords
CALL evaluation, English intonation, pronunciation software

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INTRODUCTION

The 21st century knew growing interest in integrating intonation instruction with the application of the new technologies as computer devices materials that deal with the production, perception, and comprehension of intonation. The utilization of Computer-Aided Pronunciation (CAP) programs dates back to the early 1970s and 1980s where speech technological tools were more accessible to listen and visualize rendered speech. The crucial role played by the pronunciation aspect in speaker identity, speech perception, and recognition called for investigating how Computer-Assisted Pronunciation Teaching (CAPT) is beneficial by providing automatic feedback and analyzing the phonological errors, and how pedagogical objectives can be drawn to develop the practices and research in Second Language Acquisition theories. To fulfill this purpose, CALL programs are required to be assessed. The reported reviews will enable EFL learners and teachers to use the most appropriate program that meets their needs; in addition, software designers will provide better functionalities for CAP applications.

LITERATURE REVIEW

Computer-based learning programs refer to the learning of language with, through, or around computer technological devices. History exhibits a wide range of CALL programs developed for pronunciation pedagogical purposes and speech analysis software designed depending on SLA theories and FL teaching instruction and approaches. Only recently, the intonation feature is acknowledged to be an indispensable component of spoken language and communication, and research in this area employed acoustic phonetic technologies that are embedded in CALL.

In a study on the analysis of Algerian students' English intonation, Better Accent Tutor, Speech Analyzer, and Praat were used and are found beneficial to a considerable degree ((Hamlaoui & Bengrait, 2016); (Bengrait, 2020)). The audio-visual technology was effective in data gathering, measurement, and synthesis in terms of students rendered intensity and pitch values, and which enabled the examination of intonation errors in order to suggest some remedies.

This function is applicable with the use of Automatic Speech Recognition (ASR) system which refers to recognizing human speech via computer/ program analysis tools; however, speech synthesis stands for the process used to generate artificial speech signals (Crystal, 2008). Some research studies focused on the examination of computers to assess learners' pronunciation and speaking proficiency in order to limit the teacher's role as the main model in the classroom. For instance, as cited in Chun (2002), in a pilot study on pronunciation, scores generated by machine or CALL programs were found equivalent with rates collected by human tutor.

The integration of computer-based software into intonation teaching curriculum provides the speakers with opportunities to interact among each other. Accordingly, the use of computer devices was supported to facilitate the practice of production and perception and promote interaction (Chun, 2002). That researcher focused on the

necessity to employ language-learning programs that deal with task-based and skill-based exercises, practices about language structures, listening comprehension, phonemes contrasts, or various meanings marked by intonation in context.

Chun (2002) claimed that new technologies were incorporated in intonation instruction to foster learners' perceptual skill. The speech input presented to the learners should be authentic as short dialogues occurring between native speakers, and retrieved from reliable corpora, for instance, Corpus of Spoken American English (CSAE). In light of this, non-native learners can listen to the conversation repeatedly, visualize, and analyze the pitch curves. In addition, the learners can be provided with acoustic information regarding the intonation patterns as the difference between male and female pitch contours. On the other hand, learners can be given sentences and asked to distinguish variations in attitudes that are conveyed through pitch range.

Other tools that can be used besides computer-based programs involve lower-tech multimedia devices as videotapes and audiotapes that are digitized today. Multimedia aims at displaying authentic speech in addition to cultural input including discourses that can be found in talk shows, interviews, or television news. These digitalized means provide verbal materials that describe gestural features and cultural norms. In this regard, a videodisc package has been developed as a learning material for French and German, which is centered on the non-verbal features of language, oral production, and oral comprehension (Chun, 2002). This computer program involves tasks as speaking activities dealing with body language or gestures, pronunciation, and intonation. Moreover, the users are exposed to listening comprehension of unscripted dialogues between native speakers of different languages. The approach adopted in this software is called method acting which prompts the learners to internalize and mimic the non-verbal and verbal structures of native speech. The software also contains a speech analysis aspect devised to enable the learners dealing with native-like intonation categories.

In brief, speech technological programs can be used as a research tool to develop the learning and teaching of intonation. For instance, pitch tracking devices that are built into computer programs function as a testing tool, a data collector, and a pedagogical instrument (Chun, 2002). The software can store the speakers' speech and arrange the data in a chronological order for comparing and assessing improvement through time.

Many language teachers are beginners in using CALL programs and they often view it from the learners' perspective, and they consider the software system difficult to be manipulated and to browse into its content. Bradin (1999) assumed that language teachers who are not accustomed to looking at CALL software may perceive its purpose very differently than those who are more experienced. Evaluation of computer-based programs enables teachers to judge its suitability to be used in particular language-learning environment. In addition, teachers can implement ways to employ CALL software and to estimate or assess the level of success or failure in order to utilize it in language classrooms or to adjust it for future applications.

The primary reason for teachers to evaluate language-learning software is to select the suitable one for FL learners. The teachers need to be equipped with knowledge regarding the language learning theories, objectives, and materials of the course, students' characteristics, in addition to hardware or software technology infrastructure. Reviews are another type of assessment that are centered on judging the computer program rather than the setting in which it is applied. For example, Computer-Assisted Language Instruction Consortium Journal (CALICO) and CALICO Review web page publish reviews about CALL that are a significant source of knowledge (Hubbard, 1996).

Levy and Stockwell (2006) proposed three main approaches to CALL program assessment. These are checklists, language teaching methodological frameworks or research-based criteria, and SLA theory. A checklist is a form composed of categories and questions subject to assessment and the evaluator's answers are based on information collected during the reviewing stage. Checklists comprise series of yes/no or Likert Scale question types; in addition, some checklists may include open-ended questions to comment particular aspect. As cited in McMurry, Williams, Rich, and Hartshorn (2016), a number of checklists are criticized for emphasizing the technical facet over the pedagogical functions of the software. Several checklists forms for software evaluation are downloadable online as the one suggested by the International Society for Technology in Education (ISTE). Another checklist proposed by the National Foreign Language Resource Center in Hawaii, makes use of research findings in language learning. Moreno Fuentes and Risueño Martínez (2018) believed that checklists are not necessarily to be adopted as they are but these forms can be updated to serve a specific purpose. As a result, the effectiveness of the checklists is reflected in raising teachers' awareness about certain software features and to trigger the re-evaluation of their own hypotheses and perspectives about CALL.

Computer-based software evaluation had been viewed in terms of checklists with reference to general education and no ties with language learning. Phillips (1985) proposed a framework related to methodology of language teaching that describes the language learning standards of the CALL software in connection to language focus (e.g. grammar, lexis, and discourse), learner focus (skills as speaking, reading, listening, and writing), and language difficulty.

The employment of software in language classrooms is another language teaching tool and it is built upon SLA instructions and research theories. Limited research studies are found to deal with the link between software and learning; therefore, the approach makes use of research findings retrieved from non-CALL fields and explained in CALL setting. In this regard, Chapelle (2001) suggested criteria of six principles to evaluate the appropriateness of the language learning software tasks in terms of SLA theories. She described the criteria in relation to both the aspects of the task defined by the software and those defined by the teacher. Chapelle's evaluation criteria framework is in accordance with approaches of checklists and methodological framework mentioned previously. These criteria are as follows:

1) Language learning potential: The degree of opportunity present for beneficial focus on form;
2) Learner fit: The amount of opportunity for engagement with language under appropriate conditions given learner characteristics;
3) Meaning focus: The extent to which learners' attention is directed toward the meaning of the language;
4) Authenticity: The degree of correspondence between the learning activity and target language activities of interest to learners out of the classroom;
5) Positive Impact: The positive effects of the CALL activity on those who participate in it;
6) Practicality: The adequacy of resources to support the use of the CALL activity.

RESEARCH METHOD

CALL assessment serves as the foundation for CALL designers, developers, teachers, and students to select materials that suit non-native learners' learning objectives (Curtain & Dahlberg, 2004). Thus, this study has two aims, namely:

1) to present the features involved in CALL programs and the components that help Algerian students improve their English intonation,
2) to find out the criteria to develop and choose appropriate English intonation teaching and learning software.

Materials

A set of speech programs were employed by the researcher in EFL classroom, and the results are drawn from observations of Algerian students' use of CALL and researcher judgments. These programs involve the latest versions of Pronunciation Power, Rosetta Stone, Better Accent Tutor, RTPitch, Speech Analyzer, and Praat.

Procedure

The evaluation of CALL process is drawn from approved models of materials applicability, instructional design, aesthetics, pedagogy, learning activities, and teaching practices ((Hubbard, 1987); (Pederson, 1987); (Thompson, 1999); (Chapelle, 2001); (Heift & Schulze, 2015); (McMurry et al., 2016); (Umale, 2019)). In this regard, a number of speech software are evaluated in order to help Algerian EFL teachers to find the appropriate CALL software that matches EFL teaching methods, course syllabus, and Algerian students' needs.

The evaluation is based on Hubbard (1987) checklist criteria that involve learning strategies, SLA approach, and pedagogical considerations. Accordingly, Hubbard (1996) criteria comprise three main sections: operational description of the software, teacher fitand learner fit. The assessment procedure adopts the following stages:

1. Technical Preview. It is running the software with available equipment.
2. Operational description. It is to understand how parts of the software operate, be more cooperative at first, record first impression before making any judgment, and be less cooperative later.

3. Teacher fit. It is to draw opinions about the language teaching approach reflected by the software, and the extent to which the program is compatible or incompatible with the teacher's teaching approach.
4. Learner fit to note the degree to which the software suits the students learning styles and interests, and how well the program language level, skills and curriculum content fit the learners' needs.
5. Implementation schemes. It is to reflect how CALL program is integrated into curriculum or course and what knowledge the learners need to be equipped with to ensure effective use of the software; also, to provide an account about the time spent to accomplish this process.
6. Appropriateness judgments. It is a decision to be made about the software applicability or not depending on learner fit, teacher fit and the program implementation and costs. It is important to bear in mind that the software is not perfect and criticizing its flaws should be from an objective point of view as judging a human teacher.

FINDINGS AND DISCUSSION

The pronunciation and speech analysis programs were evaluated in terms of its features and applicability, and presented in relation to pros and cons through the following figures.

1. Pronunciation power

English Computerized Learning Inc. (1995) elaborated Pronunciation Power package in Edmonton, Alberta, Canada. Over 4000 institutions as schools, colleges, and universities use the software. The following assessment illustrates the positive and negative functions of the program regarding English intonation teaching and learning.

- Pros
  - Learning levels: include beginner, intermediate, advanced.
  - Instructions: are in 13 languages including MSA (Figure 1)
  - Instructions manual: provides information on Stress, Time, Articulation, Intonation and Rhythm (S.T.A.I.R). (Figure 2)
  - Animated lessons
  - Listening exercises
  - English dictionary
  - Games
  - Graphics and photos
  - Thousands of sentences and words
  - Speech Analysis function: a sound is recorded, visualized, and compared (waveform) to the American native speaker model (Figure 3, Figure 4)
  - Pitch curves are presented
  - Pitch quality: is exemplified in voice stays the same, voice raises, voice drops, voice raises then drops
  - A special note to drive the users' attention about pitch changes at the end of the sentence.

- Dragging and aligning the waveforms with that of native speaker's model (Figure 5).

➢ Cons

- Missing information about:
  - Linguistic type of the sentence
  - Why the intonation pattern is used
  - No corrective feedback to the students renditions
- Language structures are employed in isolation and not in discourse or situational contexts.
- Waveforms acoustic details as mean pitch and intensity average are not provided.
- Software Speech Analysis function deals only with segmental and neglects intonation.
- ASR system is designed to recognize FL speech and not non-native productions resulted from FL and L1 interference.
- Pronunciations are restricted to male and NAE variety

Figure 1. Pronunciation Power Instructions in Arabic

Figure 2. Example of Instruction Page

Figure 3. S.T.A.I.R of the Consonant Sound /ʒ/

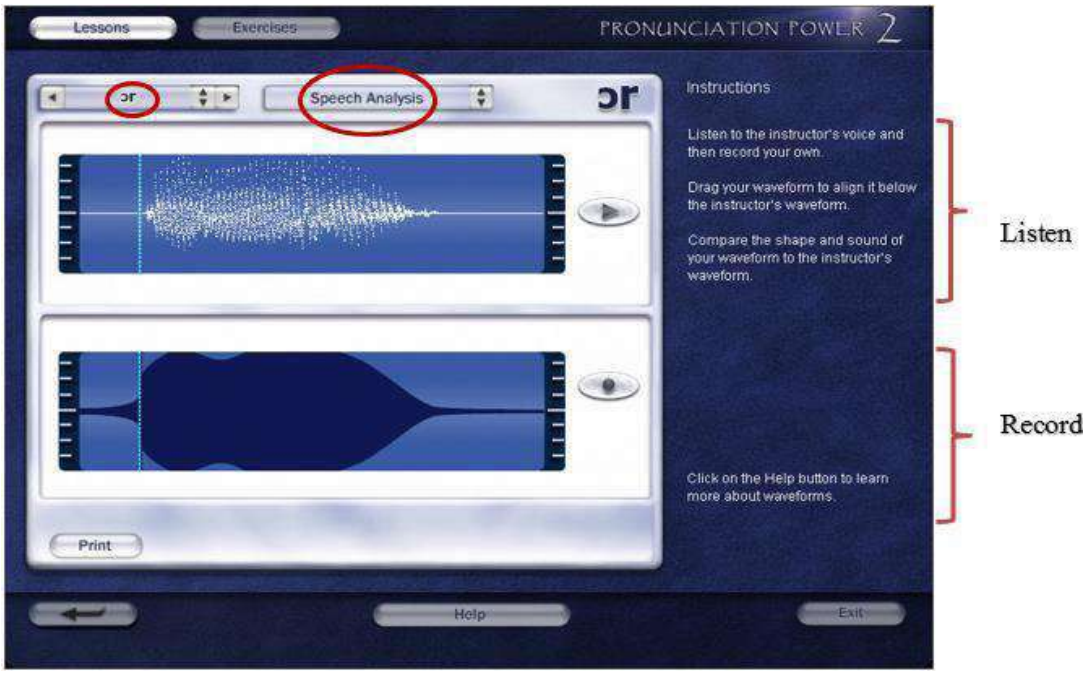

Figure 4. Pronunciation Power Speech Analysis Function of American English Vowels and Consonants Sounds

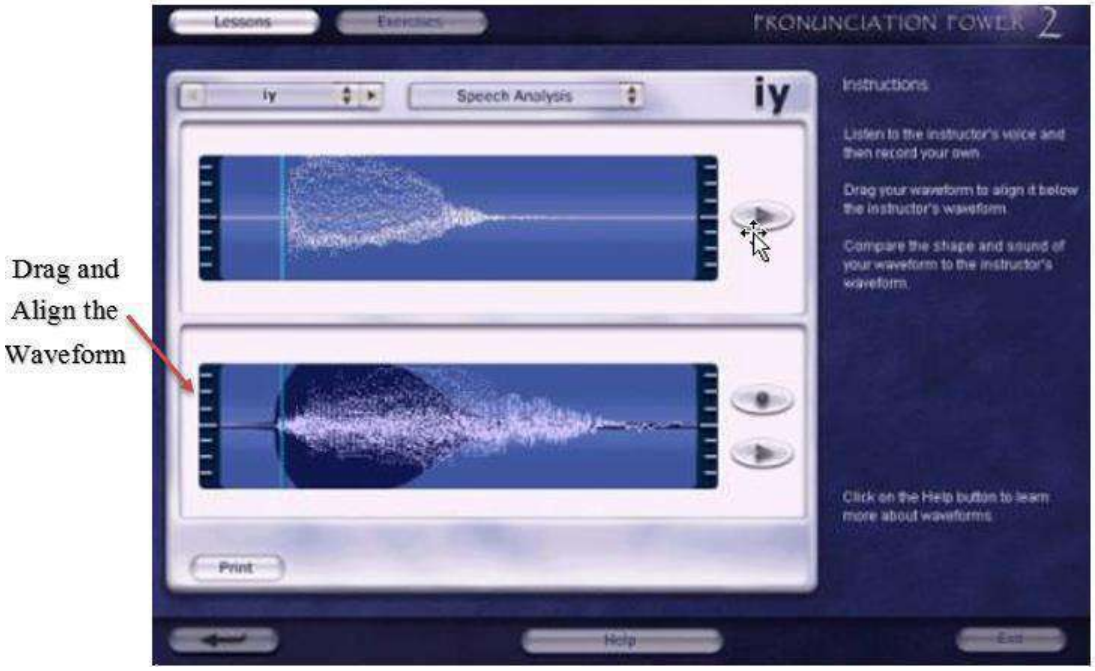

Figure 5. Acoustic Analysis of Students' Sound Segment Pronunciation

2. Rosetta stone

Rosetta stone is a computer language learning software developed by Rosetta Stone Inc (1991). It teaches up to 30 languages. The Algerian students practiced the pronunciation and speaking exercises of American English level 1 of core lesson 1 (Figure 6) and tested the use of Automatic Speech Recognition in the learning of

English Intonation. The following is a representation of the advantageous and disadvantageous of the program.

- Pros
  - It adopts the Dynamic Immersion approach that implies learning FL as children
  - Lesson involves the four skills + review (Figure 6)
  - Speech Lab: Listen and record (Figure 7)
  - American female and male model speakers
  - The accuracy level is demonstrated in colors (Figure 8)
  - The use of speech models of many languages to provide high level of speech recognition.
  - Real-time evaluation: allows to compare with millions of samples of native and non-native speakers i.e. corrective feedback.
  - Visualizing waveforms, pitch curves, and formants (Figure 9).
  - Dialogue simulation: offers virtual and contextualized conversation.
  - Live Tutoring Sessions that is an online learning environment with a native speaker.
- Cons
  - User input evaluation is limited to how well segmental are pronounced regardless of pitch curve matching or non-matching with the American native speaker's production.
  - ASR system focuses on the segmental aspect as accurate pronunciation regardless of pitch curve mismatching with the native speaker model (Figure 10).
  - No interpretation of pitch display
  - It does not encourage translation to Algerian Arabic L1 or MSA

Figure 6. Rosetta Stone Core Lesson 1

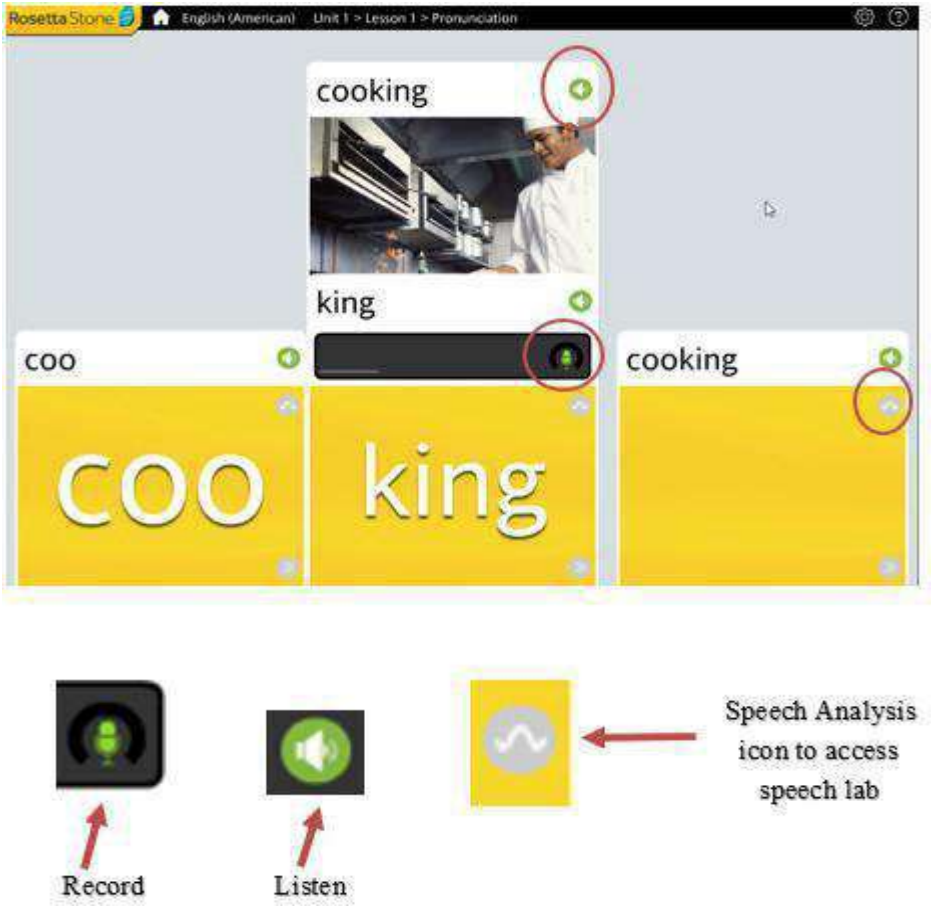

Figure 7. Rosetta Stone Listen and Record Functions

Figure 8. User Pronunciation Evaluation

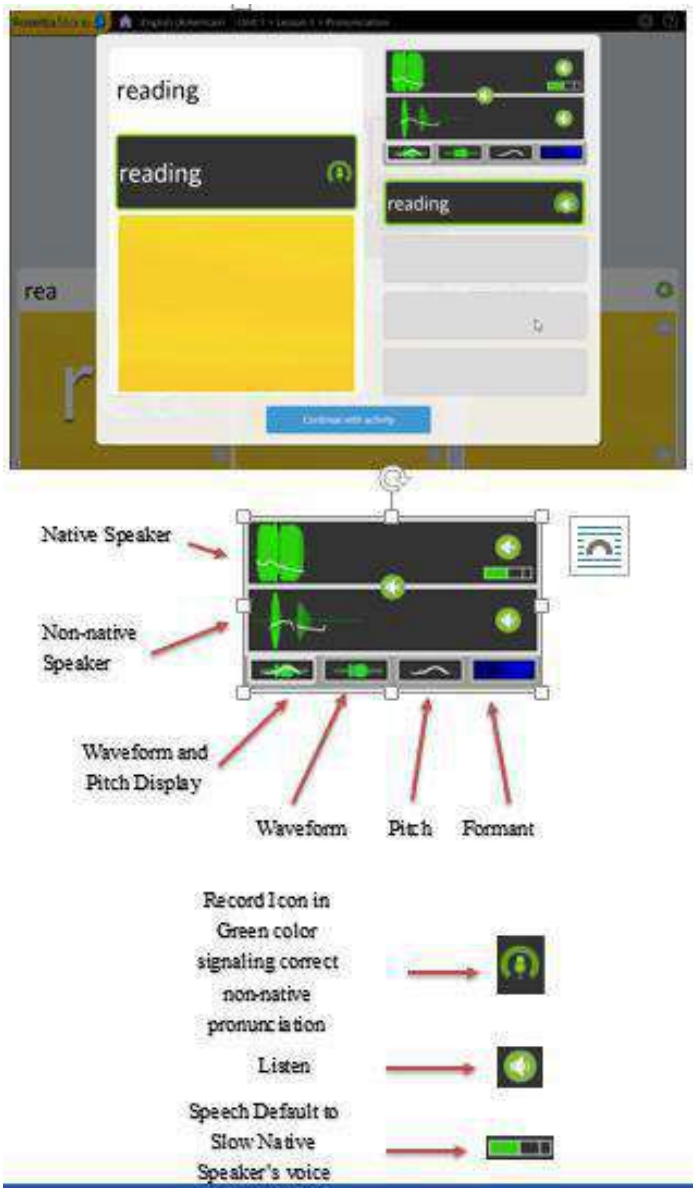

Figure 9. Rosetta Stone Speech Lab

Figure 10. Differences in Intonation Contours of American Native speaker and Algerian Non-native Speaker

3. BetterAccent Tutor 2.0

Better Accent Tutor, invented by Komissarchik and Komissarchik (1997), is a program that focuses on the learning of suprasegmental features. The program is found to focus on some speech-related aspects and neglect others; some of these are presented as follows:

- Pros
  - American English stress, rhythm, and primary focus on intonation.
  - Mimicking and audio-visualization of pitch and intensity
  - Two separate windows, restart, repeat the rendition, synchronous pitch analysis (Figure 11)
  - Highlighting the played back syllables (Figure 12)
  - Show explanation box: provides information about stress placement, and the nucleus of intonation contour (Figure 12).
  - ASR system detects word boundaries and segments including vowels, consonants, and syllables, in addition to pause, voice, nasal, burst, noises, etc.
- Cons
  - No instructions on speech visualization, syllable length, loudness, pauses, rising, and falling tone.
  - No corrective feedback
  - Program curriculum is not designed in relation to particular level as beginner, intermediate, or advanced
  - Comparison with native speaker's pitch curves, intensity and rhythm except for contrasting both speakers' waveforms
  - It focuses on the teaching of American English and it neglects other English varieties
  - Algerian students' errors are not detected or explained
  - No practice is provided in discourse intonation
  - It teaches intonation separately from other language aspects as grammar, vocabulary, discourse, and pragmatics
  - No phonetic transcription of the utterances is provided.

Figure 11. BetterAccent Tutor Comparison of American Native Speaker and Algerian Student English Intonation

Figure 12. BetterAccent Tutor Highlighting American Native Speaker's Produced Syllables and the Intonation Pattern Center

4. SFS/RTPitch

RTPitch is a free windows tool developed by Huckvale (2011) at the University College London. The program main functions analyze pitch and intensity. Some of the program positive and negative functions are indicated in the following:

- Pros
  - It Analyzes pitch and intensity
  - Real-time display of frequency tracking, spectrums, and waveforms visualized in one or two track channels (Figure 13).
  - It can be applied on discourse input (Figure 14).

➢ Cons

- A speech analysis program designed with no reference to language/pronunciation learning program.

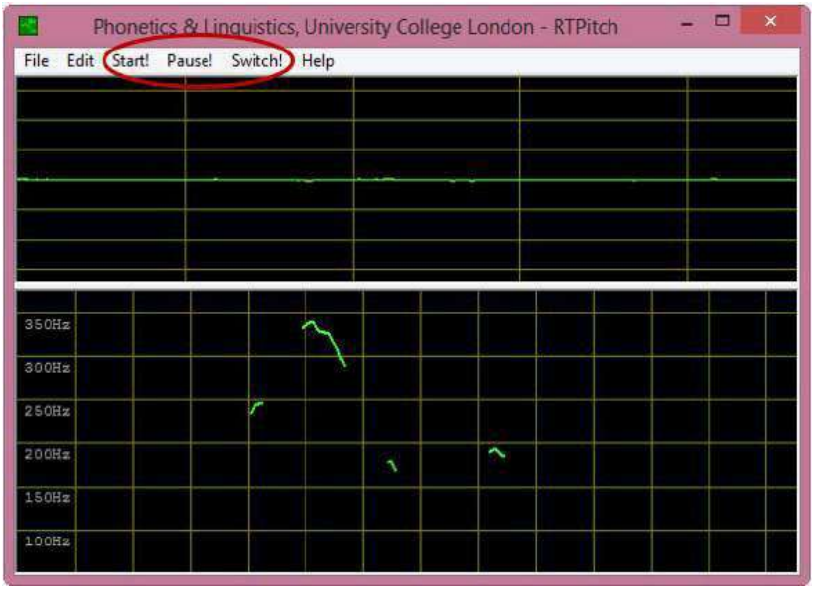

Figure 13. SFS/RTPitch Real-time Analysis of Tag Question Pitch Contours

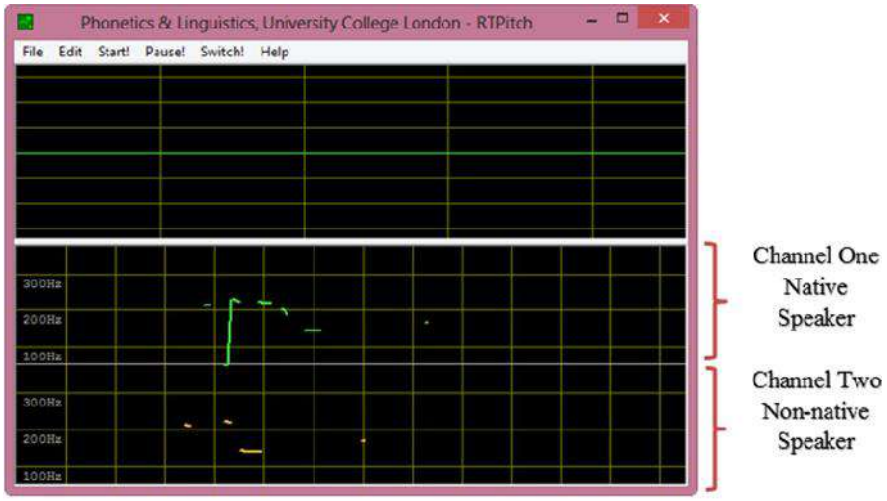

Figure 14. RTPitch Comparison of American Native Speaker and Algerian Non-native Speaker's Intonation

5. Speech Analyzer

The program Speech Analyzer version 3.1 was developed by SIL International (2012). The software is a useful tool for linguists and ethnomusicologists to record, transcribe, and analyze acoustically speech signals and music recordings.

➢ Pros

- It requires a user with the least knowledge s/he has in acoustic phonetics to measure pitch and intensity of speech signals
- Annotation of pitch

- Information is provided about:
  - Fundamental frequency (F0)
  - Spectral/ spectrographic investigations
  - Duration of measurements, gloss and tone transcriptions
  - Sound phonemic, phonetic, and orthographic representations
- Mimicking speech sounds
- Software functions as overlays, repetition of loops, and recordings playback (Figure 15)
- wav and mp3 files
- Comparison in one editing window (Figure 17)

➢ Cons

- The subject has to start recording immediately with the use of record overlay function in which the occurred sounds or noises in the surrounding are detected as well (Figure 17).

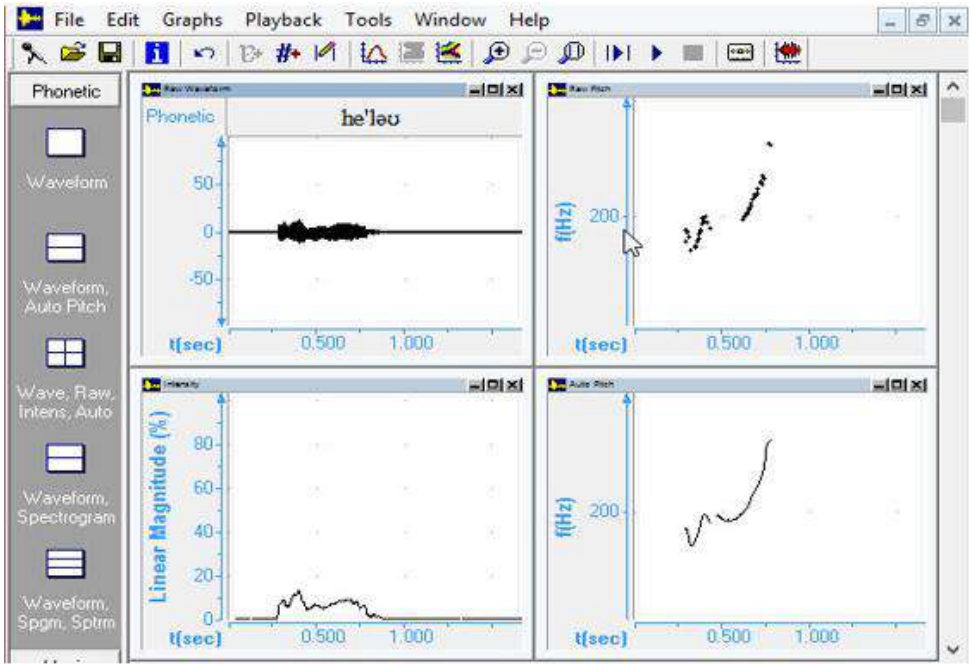

Figure 15. Speech Analyzer

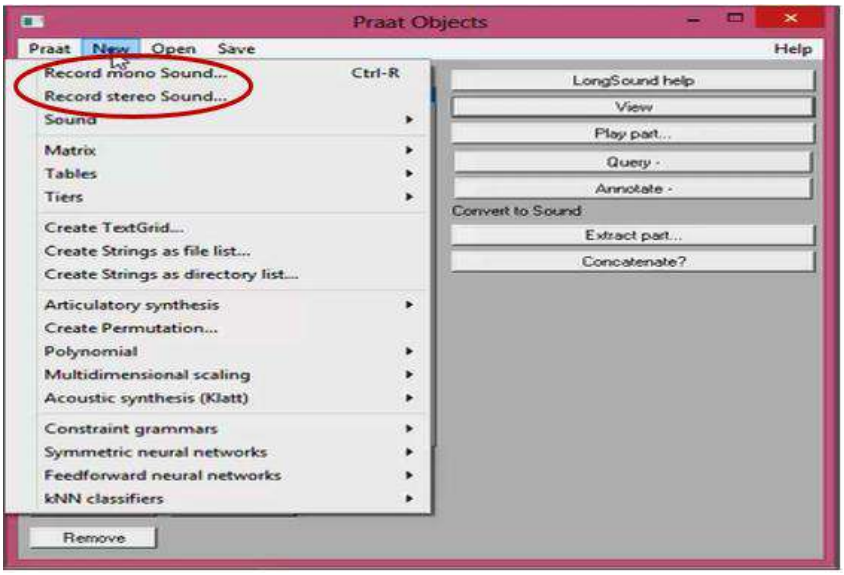

Figure 16. Recording Mono and Stereo Sounds

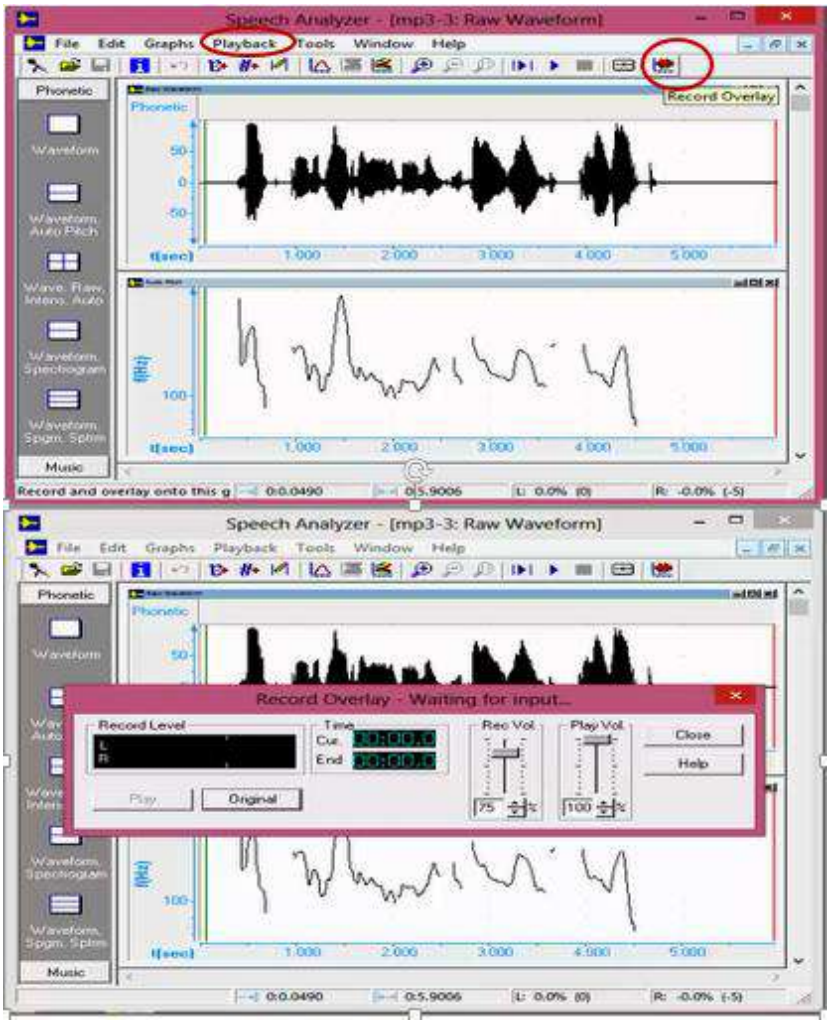

Figure 17. Speech Analyzer Record Playback and Record Overlay Functions

6. Praat

Praat is an open source package elaborated by Boersma and Weenink (1993) at the University of Amsterdam, and it is a useful tool for linguists to analyze speech.

- Pros
  - The least knowledge s/he has in acoustic phonetics to measure pitch and intensity of speech signals
  - Recording of speech:
  - Microphone function →Object>New > Record mono sound (or stereo sound)
  - Import audio file:
  - Microphone function →Object >Open > New> Read from File (Figure 16)
  - Imported long file → displayed in parts through: Object > Open > Open long file
  - Editor window → Object > View and Edit, in which the sound waveform, pitch and intensity are automatically presented (Figure 18, Figure 19).
- Cons
  - Record a sound file of one minute long: long chunks cannot be recorded.
  - Waveforms or pitch curves as the productions are performed and displayed in separate windows.

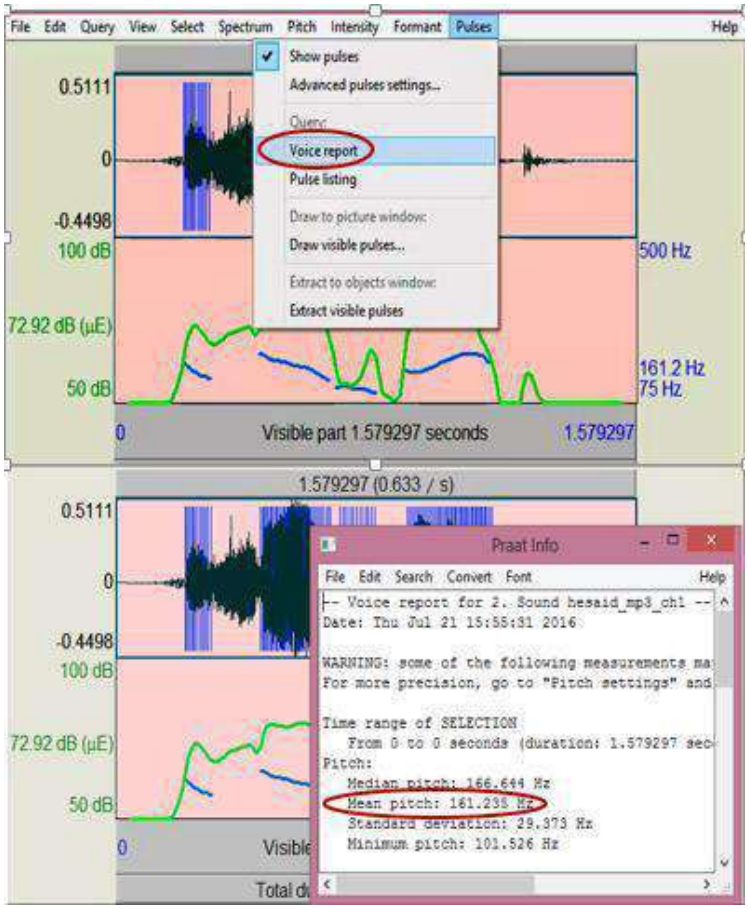

Figure 18. Measurement of Mean Pitch

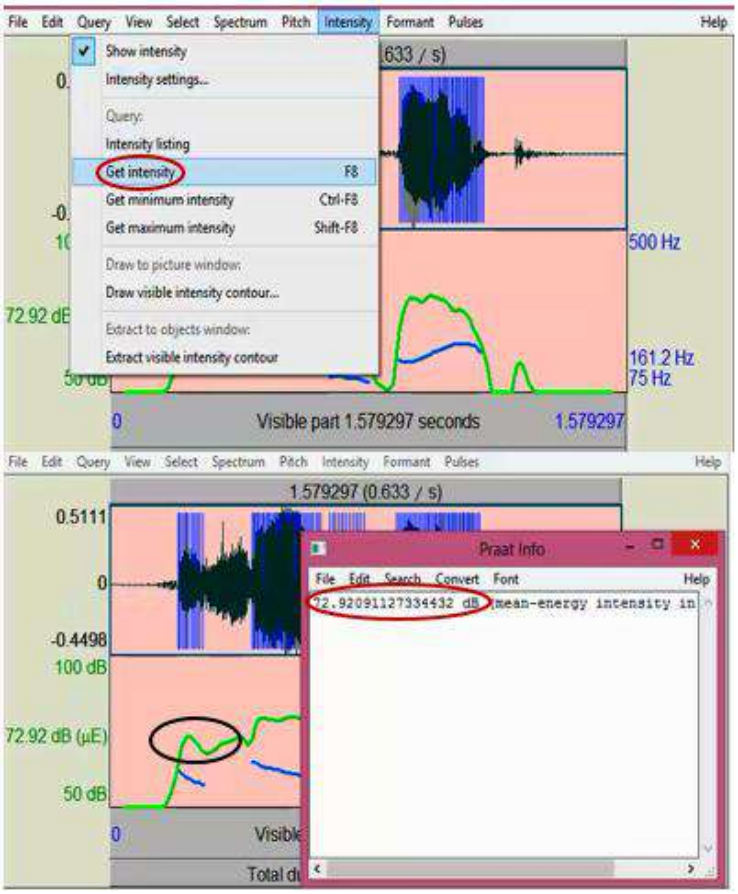

Figure 19. Measurement of Average Intensity

The compiled results from different CAP and speech software revealed that signal analysis program effectiveness is linked not only to the learning of English intonation at sentence-level but also at discourse-level. Acoustic phonetics tools and discourse analysis principles are integrated to ameliorate the design of speech analysis software. Preliminary criteria for software design to learn discourse intonation may incorporate speech analysis program that is accessible for the learner and its content is generated on the basis of experimentation and evaluation of different speech technologies.

The scope of intonation training has extended sentence level to involve context and distinguishing the contrastive acoustic features of English intonation. Intonational distinctions between English and Arabic, in the context of the present study, can result in a sociocultural misunderstanding as Arab speakers in general often use low pitch and dropping loudness that signifies in English turn-relinquishing signals; therefore, native speakers of English may misinterpret this as an attempt to have control over the conversation. Research is to be carried out in acoustic parameters studies and developing tools for data collection with the use of speech analysis software. Integrating technology to promote intonation instruction requires computer software or hardware to function as facilitator, recorder, and analyzer of speakers' interactions.

Pitch tracking component in speech analysis software should be built in relation to sociocultural differences of intonation patterns and communicative discourse or spontaneous speech. CALL programs should be able to interpret intonation patterns in terms of (1) pitch direction change from level and rise to fall contours; (2) pitch range from low and mid to high; (3) pitch change speed as whether it is gradual or abrupt; and (4) pitch change placement within syllables in a sentence. Additionally, the software should deal with intonation at sentence level as well as at sociolinguistic, grammatical, attitudinal, and discourse levels.

Pronunciation software should expose EFL students to authentic corpus or natural speech in cultural situations at later stages of learning English intonation, instead of employing only carefully formulated dialogues. The teacher can select a natural conversation performed by two native speakers of English in which the utterances are analyzed acoustically by providing immediate audio-visual feedback and intonation contours interpretation.

ASR models are used in controlled situations mainly in evaluating and scoring learners' performance. However, ASR may not be adequate in dialogues practices due to the complexity in discriminating out-of-context utterances. There are number of constraints concerning ASR systems use in CALL programs as these systems are built on recognizing native speakers' speech and may not distinguish FL learners accented speech. The reliability is very important in understanding correct rendition of the learner; nonetheless, if these systems fail, the learner would be frustrated and interaction is reduced.

The adopted type of User Interface (UI) plays a role in motivating the learners; thus, it should focus on encouraging them rather than stressing punishment or reward. In order to meet this goal, the representation of the content in terms of sounds, pictures, curriculum content, and tools should raise the learners' attention and enthusiasm towards the learned pronunciation aspect. Similarly, model speaker's voice or speech interface is significant in providing instructions and creating a relaxing atmosphere that would urge the learners to interact better with human voice rather than a machine voice. The speaker's intelligible voice enables the learners to grasp and perform better the pronunciation tasks.

Materials and tips can be presented with a cartoon character or Animated Pedagogical Agent (APA) that is similar to human person in a face-to-face interface. Other tools may be effective as employing a video with speaking avatar, emoji, or emoticons to react to the learners' input. For instance, the program Virtual Language Learning Entity (VILLE) aims at teaching Swedish. The conversational agent Ville has characteristics as lip synthetic and synchronization of natural speech, nodding, frowning face, eyebrow movements, and others.

Figure 20. The Virtual Language Tutor Ville

The presentation of software learning materials in different colors motivates the learners to complete the tasks. Highlighting common information with particular color enables the student to master easily knowledge as in the mentioned description of Rosetta stone the mispronunciations are indicated in red or yellow depending on the error degree and accurate pronunciation is shown in green. However, involving more than 10 colors may cause the student to misinterpret the information and fail to link the knowledge with its corresponding color.

The pronunciation software involves teaching styles that permit the FL learner to combine words and images with knowledge stored in long-term memory. Information is transferred from long-term memory to the working memory that serves as a cognitive system responsible for holding, processing, and manipulating knowledge. The following features and objectives are suggested to be checked by the teacher or the student:

Pronunciation and Intonation Software General Description
User Age:

- ☐ Children
- ☐ Adult

Learning Level

- ☐ Beginner
- ☐ Intermediate
- ☐ Advanced

Technical Requirements

Computer Type……
Computer Operating System ……
Software version……
Drive: CD-ROM or DVD-ROM……
Memory ……

Program installation……
Program removal……
Other……

Documentation

☐ Description of the software goals and content (lesson plans and exercises)
☐ Program appropriateness
☐ Program tutorial
☐ Program review

Copyrights

Developer (s) ……
Funder (s) ……
Year of Release ……

License

☐ License and password
☐ Open source

Pedagogical Features

☐ Motivation
☐ Interaction
☐ Intelligibility
☐ Learner control
☐ Flexibility
☐ Native language sensitivity
☐ Sociocultural differences

Feedback

☐ Automatic feedback
☐ Marking the correct and incorrect answer
☐ Request repetition
☐ Explaining inaccurate responses
☐ Suggesting materials or items to improve the incorrect answers
☐ Exit option

Pronunciation Input

☐ Lesson: presentation of materials accompanied with activities
☐ Suprasegmentals: Stress, Rhythm and Intonation
☐ Different model speakers male and female
☐ Different varieties of English language
☐ Structured Activities: organized from easiest to the more challenging ones
☐ Teacher Fit Approach: evaluation of the program compatibility with SLA theories
☐ Learner Fit Approach
☐ Learner variables: gender, age, interests, needs, proficiency level, L1
☐ Learning styles: learning strategies, motivation, cognitive styles, etc.
☐ Linguistic objectives: phonology, discourse, syntax, text, etc.

☐ Classroom management: independent use or in pairs.

Intonation Input

☐ Authentic speech

☐ Audio-visual representation of intonation patterns: pitch, waveform, and intensity

☐ Measuring pitch and intensity

☐ Intonation errors detection and assessment

☐ Interpretation of pitch curves depending on knowledge provided by the software manual

☐ How to align and compare native speaker's and non-native speaker's waveforms

☐ How to improve intonation

☐ Real-time speech or pitch analysis

☐ Scoring: indicating proficiency level

Intonation Activities

☐ Exercises in relation to other language aspects as vocabulary, grammar, pragmatics, stress, rhythm, and language skills.

☐ Exercises on word and sentence-level intonation.

☐ Contextualized learning: discourse-level intonation, dialogues simulations, role-play, live chat.

☐ Linking exercises to real-life environment and communicative situations.

☐ Exercises involve listen, record, visualize and compare speech.

☐ User can select the exercise

☐ User can revise and review the materials

☐ Opportunities or trials to rehearse before being evaluated

☐ Tasks-based on automatic speech recognition system

☐ Pronouncing one word separately

☐ Pronouncing several words

☐ Pronouncing one sentence separately

☐ Pronouncing several sentences

Tests/Quiz

☐ Revision of the learned materials

☐ Scoring answers

Interface

☐ Animation and graphic representation including images, videos, EMOJI and emoticons, etc., and articulatory representation of sounds.

☐ Animated pedagogical agent: talking head.

☐ Background music with less noise and distraction factors

☐ Coloring materials

☐ Combination of auditory and visual tools

☐ Automatic Speech Recognition (ASR) system:

☐ Treats native speakers' utterances and non-native speakers accented speech

☐ Errors are recognized and marked

- ☐ Asks to repeat the pronunciation
- ☐ Does not recognize errors
- ☐ Recognizes noises in the surrounding environment
- ☐ Aims at accuracy
- ☐ Aims at intelligibility
- ☐ Corrective feedback presented in waveform, pitch, and articulatory movements.

Technical Features

- ☐ Use instructions are provided in software manual or program description
- ☐ Individual use in laboratory
- ☐ Use in laboratory or class under teacher supervision
- ☐ Independent use in personal computer
- ☐ High quality of the voice
- ☐ Recording and saving data in audio files and screenshots of synthesized speech
- ☐ Readable text inserted in dark color on a light background
- ☐ Using hypertext links
- ☐ Help button: provide assistant to a given item
- ☐ Security

Accessibility and Cost

- ☐ CD-ROM
- ☐ Web-based tutorial
- ☐ Download free demo

CONCLUSION

Technological devices to language learning and teaching are found to assist learners improving the TL proficiency at syntactic, semantic, and pronunciation levels. Research on language and speech reviewed how the use of computer-aided instruction can enhance L2/FL communicative competence with the availability of low cost computers. Previous research literature on intonation training recognized the effectiveness of audio-visual display and some technical difficulties and pedagogical deficiencies that may occur during the employment of computer-based language learning programs. The assessment of CALL materials reflected the application of one-sided approach and promoted the utilization of checklists; moreover, the evaluation revealed the complexity of L2/FL classroom and the context in which computer program is used. Consequently, this allowed the researcher to determine strengths and weaknesses of CAP pedagogy in the past and recent studies and for which research is to be continued with this respect.

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