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Ear Training Made Easy: Using IOS Based Applications to Assist Ear Training in Children

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Abstract

It is an inevitable reality that in all developed countries and in most developing countries, smart phones and tablets are an indispensable part of most children's lives. There are many discussions and heated arguments on the negative and positive effects of digital technology on the development of children. In this paper, accepting the fact that this technology is a part of most children's daily lives, it will be questioned whether this technology may be used to reinforce certain components of music education in general classroom and especially in private music studios. In conservatories and music schools, a considerable amount of time is dedicated to aural training of younger students. However, during music lessons in the classroom and during the instrumental lessons in private studios, lesson time is mostly dedicated to other components such as improvement of technique, musicality and sight reading. Thus, a crucial part of music education "ear training" is neglected to some extent. In this paper, several IOS based ear training applications will be evaluated considering the target group, children between ages 6-11. The possible effects and incorporation of these applications into the classroom and private studios will be discussed. Each application will be evaluated on several components; the ear training modules, user-friendliness, possibility of the evaluation of students' progress by the teacher and probable reaction of the children to these applications.

Keywords: Music education, ear training, IOS based applications, private music studio, classroom teaching, technology, education, teaching

Introduction

It is an inevitable reality that today, smart phones and tablets are an indispensable component of modern life. The way people interact and communicate with one another changed drastically with introduction of mobile technology into daily life (Briz-Ponce et al., 2017). As this technology becomes an obligatory part of adult life, it is subsequently introduced to children's lives as well. There are many arguments and various research on the effects of this technology on the development of children. Consequently, many public health organizations published warning and guidelines for parents, health givers and educators regarding the use of digital technology by children. For instance, in 2016 American Academy of Pediatrics (AAP) released recommendations for parents, educators and health care providers regarding the use of this technology for children from birth to age eight (as cited in Miller at al., 2017). Despite the proposed restrictions on screen time, the use of digital technology is also encouraged as an educational tool. As an example, in 2015, a guideline supporting the use of digital educational technology to enhance learning in younger children was issued by Australian Children's Education and Care Quality Authority (Miller et al., 2017).

By many researchers and educators, mobile technology is considered as the great revolution in teaching (Castillo-Manzano et al, 2017). Many universities already incorporated mobile learning into their curriculum to provide more flexibility and wider spectrum. According to a meta-analysis of 110 studies conducted in 2016, investigating the effects of mobile devices on student learning, the use of mobile devices is shown to be more effective for learning (Sung, Change, & Liu, 2016 as cited in Heflin, Shewmaker, & Nguyen, 2017). Among other subjects, digital technology is introduced into music classroom as well. There is a wide variety of technological devices and software available that may be used for notating, transcribing, composing and recording music. As digital technology becomes more widespread in classrooms of universities and high schools, it also used in preschool and elementary school education. The question that comes to mind is whether younger children can use this technology effectively. In a study conducted by the Sesame Workshop and the Cooney Center 114 children between the ages four to seven were interviewed with a focus on iPhone and iPod touch applications. The results showed that most children were able to use these devices on their own or other became adapt after receiving a little help at the beginning (Chiong & Shuler, 2010).

Since the mobile technology may be used by younger children and it is already used and suggested as an educational tool, it may be possible to use it more effectively as part of music instruction among students aged 6-11. Since music is an art form based on sound, improving the hearing skills in other words, ear training, should be an important part of music education from the very beginning. Usually, in conservatories and music schools, a considerable amount of time is dedicated to aural training of younger students. However, during music lessons held in the general classroom and

during the instrumental lessons in private studios, lesson time is mostly dedicated to other components of musical education, leaving limited time to aural training. The use of appropriate technological tools may facilitate learning aural skills (Pomerleau Turcotte, Moreno Sala & Dubé, 2017).

As the use of smart phones and tablets become more widespread, they become preferred devices for using the educational technology in the classroom and private studios. iPads are considered to be useful tools for music teachers and students. They may be used in the classroom and at home as part of individual or group study (Riley, 2016). In an abundant app market, it is very difficult to find user friendly apps with educational benefits which children would love. There has not been a systematic analysis of the educational apps available (Goodwin and Highfield 2012). Burton & Pearsall encourage researchers to analyze the apps and make trusted recommendations to parents and educators (2016). Considering iPads are one of the preferred mobile devices used in classroom and everyday life, only IOS based ear training applications will be evaluated considering the target group, children between ages 6-11. There are many IOS based apps classified under music and educational content in App Store. While choosing the initial apps, only the free apps or apps with free versions are chosen since majority of the parents prefer to download free applications for their children (Chiong & Schuler, 2010). Approximately 60 free apps that may be used for ear training are downloaded and are evaluated on several components: the ear training modules, user-friendliness, possibility of the evaluation of students' progress by the teacher and probable reaction of the children to these applications. Most of these applications target relative pitch training while some of them also target perfect pitch training. The ones designed to work on relative pitch training typically included modules on intervals, scales, chords and harmonic progressions. The most popular instrument of choice is the piano. Most of these app which are designed for educational purposes use simple graphics. Since younger children prefer high degree of visual stimulation, animation and familiar musical content (Burton & Pearsall, 2016), most of these apps may not be suitable for the younger children. For this purpose, apps in game format are also analyzed. In the following section, first apps with more educational content will be discussed, later the apps with game like formats will be reviewed in alphabetical order.

Analysis of Aural Training Apps

Apps with Educational Design

Aural Trainer 1-5

ABRSM Aural Trainer Lite, The Associated Board of the Royal Schools of Music (Publishing) Limited, 329.9 MB, Requires iOS 8.0 or later, Compatible with iPhone, iPad, and iPod touch, English, Age Rating Rated 4+, Copyright © The Associated Board of the Royal Schools of Music (Publishing) Limited, In-App Purchases, Grades 1-5

$7.99, Grades 1-3 $4.99, Grades 4-5 $4.99 https://gb.abrsm.org/en/exam-support/practice-tools-and-applications/aural-trainer/

ABRSM (Associated Board of Royal Schools of Music), as United Kingdom's largest music education body is one of the world's leading provider of music exams. ABRSM aims to inspire higher achievement in music and music learning around the world. According to the data given on official ABRSM web page, 600,000 candidates in over 90 countries are assessed every year in music exams (2018). ABRSM Aural Trainer 1-5 app is designed around the components of ABRSM aural tests for examination grades 1-5. The app includes 5 main modules titled Grades 1-5 correlating with materials required in grade examinations as well as Interval Trainer module.

Grades 1-3 includes modules titled Pulse and Meter, Differences, Echoes and Musical Features. In Pulse and Meter module, the student is expected to tap the mobile device following the beat of the music and identify whether the composition excerpt is in two, three or four time without naming the time signature. In Differences module, a two-bar phrase is played by twice and the student is supposed catch the melodic or rhythmic mistake in the second repetition by tapping the device. In Echoes module, the student repeats short melodies played by the device. The sung melody is recorded during the exercise and may be played back with or without piano accompaniment. In Musical Features, a musical excerpt is played and questions about musical elements regarding tonality, dynamics, articulation and tempo are asked.

Grade 4 and 5 includes modules titled Melodic Repetition, Sight-singing and Musical Features and Meter. In Melodic Repetition, student sings back a melody played by the device. The sung melody is recorded during the exercise and may be played back with or without piano accompaniment. In Sight-singing module, five notes are given in a major key, student is supposed to sing them after the key chord and the first note of the melody is played by the device. Feedback about the correctness of the sung pitch is provided. In Musical Features and Meter, the student answers questions about different aspects of the composition performed, including dynamics, articulation, tempo, tonality, character, style and period. After a second listening, student is supposed to tap rhythm of the notes by tapping the device and identify the time as in two, three of four time without identifying the time signature.

Interval Trainer includes study of all intervals within unison and octave. There are options of practicing melodic and harmonic intervals. The student may choose a range up to a minor 3rd, perfect 5th and an octave. This module does not give the option of choosing intervals going up or down. Both are asked randomly after the range is chosen.

The content of the application is very well constructed. All exercises contain progressive elements. Listening examples for musical features and pulse and meter sections are chosen from famous classical music examples. It is possible to follow progress of the student in Progress section. The components that are missing in this

application are chord progressions and recognition of chord types. The serious dark grey setting of the app may not be appealing for the young student. However, a student who is already getting ready for the grade examinations should easily be able to use this application during the preparation period. The app does not have any instructions section. It is designed to enforce the material already studied during the lessons. Although designed specifically to assist the ABRSM grade exams, this app may also be used by regular students who are already learning some of these concepts in the classroom.

Aural Trainer Lite Version includes Grade 1, Grade 4 and Interval Trainer. Parents and educators may be encouraged to purchase the full version after trying out the Lite version.

Aural Wiz

Aural Wiz, Intervals, Scales, Chords etc, JSplash Apps, 10.7 MB, Requires iOS 9.0 or later, Compatible with iPhone, iPad, and iPod touch, English, Age Rating Rated 4+, Copyright © 2017-2018 JSplash Studios Pvt. Ltd, Free[1]

This is a colorful user-friendly app with 5 modules consisted of Intervals, Scales, Modes, Chords and Cadences. All modules are divided into two submodules of Learn and Practice. Intervals module provides the option to study melodic and harmonic intervals within the range of an octave. Different intervals may only be heard going up. In the Scales module, major, natural, melodic and harmonic minor scales are practiced. Scales are played in one octave going up and down. In Modes module, Ionian, Dorian, Phrygian, Lydian, Mixolydian, Aeolian and Locrian modes are available. Scales in Modes module are only played going up. In Chords module, major, minor, augmented, diminished, dominant seventh, minor seventh and major seventh chords may be practiced. The option of hearing the chords as arpeggiation or block chords is available. The chords are arpeggiated going up. In Cadences module, perfect, plagal, imperfect and interrupted cadences are practiced in major and minor keys. In Practice sub-module, two root position cadence chords are played following the key chord. Voice leading is not always taken into consideration.

This is a simple educational app with a basic design where a beginner student may use to work on the materials learned during music classes. It has simple but colorful graphics. It is easy to comprehend and use the app. Since the modules do not have progressive study options, the teacher must give assignments to the student creating a study curriculum. In the Learn module, only English note names are used. Solfege syllables are not available. Statistics are available, and it is possible to reset them. So, the teacher may reset the statistics to observe the number of exercises done during each study session.

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[1] https://www.auralwiz.com/

Ear For Life

Ear For Life, Ear Training, Mathias Navne, 78.8 MB, Requires iOS 8.0 or later. Compatible with iPhone, iPad, and iPod touch, English, Age Rating Rated 4+, Copyright © Mathias Navne, Free https://iphoneappli.wordpress.com/earforlife/

This app consists of two main modules: Perfect Pitch and Relative Pitch. Perfect Pitch module is divided into two sections: Note and Melody. In Note section, the student may practice up to 12 chromatic notes. There is the option of hearing these notes in low, medium, high and full range. In Melody section, a melody consisting of 4 notes are played within an octave. The beginning note is given using English names. Same exercise may be listened couple of times but can only be played on the available piano keyboard once. Each note on the piano keyboard is named with note names so that a student who cannot play piano may also guess the melody notes. In Relative Pitch module, there are there sections: Chords/Arpeggios, Intervals and Scales. They can all be practiced in low, medium, high and full range. In Chords/Arpeggios section, there is large selection of chords under Major, Minor, Dominant 7, 9th& 11th& 13th, Sus & Aug & Dim groups. Any combination of chords may be chosen. This is a good app for a student who wants to practice hearing more complicated chords such as Maj6b5 or Maj7#7. In Intervals section, all intervals within the range of an octave is studied. The option of hearing intervals going up, going down and played harmonically is available. In Scales module, there is a large selection of scales organized under the sections of Major, Melodic Minor, Harmonic Minor, Pentatonic and Diminished. In Scales section titled Major; Dorian, Phrygian, Lydian, Mixolydian, Natural Minor and Locrian may be found. In the Scales section titled Minor, melodic minor, dorianb2, Lydian Aug, Lydian Dom, Mixolydian b6, Locrian #5 and super locrian scales are found. Each module is designed with several scale options.

Ear For Life app does not offer a systematic study plan. The teacher also needs to set a curriculum for each student before using this app. The app does not offer any statistics either. The fact that there is no possible way of seeing the student's progress makes this app less suitable for studio teaching. Note guessing in the Perfect Pitch module may be useful for younger students. The dark colored graphics may be not be attractive for the very young music student. However, the Chords/Arpeggios and Scales modules are more detailed than many other free applications. It may be useful for more advanced music students who successfully completed the basic features of ear training and ready to learn new concepts.

Ear Trainer Lite

Ear Trainer Lite, thoor software AB, 104.1 MB, Requires iOS 9.2 or later, Compatible with iPhone, iPad, and iPod touch, English, Age Rating Rated 4+, Copyright © thoor software ab, Free, Full Version $7.99 http://www.dev4phone.com/

This app is formed of 5 modules titled Interval Comparison, Chord Identification, Chord Progressions, Scales and Melody. In Interval Comparison I module, student

exercises is hearing the larger of the two intervals. First exercises start on common root and move on to different roots. Upward melodic, downward melodic and harmonic intervals ranging from a minor second to tritone are studied in this level. In Chord Identification I, major and minor chords played in upward and downward arpeggios and as block chords are identified. In Chord Progression I, dominant (dominant 7) to tonic chord progressions in major and minor keys is studied. In Scales I, ascending and descending complete major, minor, pentatonic and blues scales are studied. In Melody I, student is supposed to identify notes in C major and C minor scales within the third of the tonic (do re mi). Earlier exercises do not include a rhythmic component whereas the later ones do. In the general settings of the app, the option of English, German and solfege syllables is given. It is also possible to adjust the tempo of each exercise. Statistics are also provided. It is possible to see whether the student completed an exercise group. The app also provides feedback for the student telling to redo the exercise or to move to the next exercise group depending on the accomplishment of the student on each exercise level.

Ear Trainer App has simple and neat graphics and is user-friendly. A student from the older margin of the target group may easily use this app. Each main component of this app is designed for gradual learning. So, the student who completes one set of exercises successfully may advance to the next level without the assistance of a teacher. The teacher may follow the progress of the student from Statistics section. A younger student may need assistance from the teacher or the parent while using this app in order to stay focused and complete necessary exercises. The lite version provides level I of exercises which are sufficient for studying basic concepts of ear training. The complete version would be a good investment for the student to develop better listening habits.

Earpeggio

Earpeggio, Musical Ear Training Exercises, Blazing Apps Ltd, 59.6 MB, Requires iOS 9.0 or later, Compatible with iPhone, iPad, and iPod touch, English, Hungarian, Age Rating Rated 4+, Copyright © 2018 Blazing Apps Limited, Free

It is one the most comprehensive free apps for aural training found in App Store. It includes Interval Comparison, Interval Identification, Intervals in Context, Chord Identification, Chord Inversion, Chord Progressions, Scale Identification, Scale Degree Identification, Melodic Dictation, Rhythm Dictation and Tempo Identification as modules. In the Interval Comparison and Interval Identification sections, all intervals raging from unison to two octaves may be studied. Ascending, descending and harmonic playing modes options are available. Intervals in Context module provides the option of choosing all intervals raging from unison to two octaves with or without fixed root note. The listener is supposed to guess the interval between the first and the second note after hearing three successive notes. Ascending, descending and harmonic options may be selected before starting the exercise. Chord Identification module includes major, minor, diminished and augmented triads, all possible 7th

chords and more advanced 7th chords labeled as German, French, Swiss, Tristan. Ascending, descending and harmonic playing options are also available for this component. The root of the chords may be fixed or not fixed. Chord Inversions module includes major, minor and diminished triads in root position, first and second inversions. Ascending, descending and harmonic options may be selected before starting the exercise. The root for the selections may be fixed or not fixed. In Chord Progressions module, progressions of two to four chords are played. The chords may be chosen from a large selection of major triads, major sevenths, minor triads, minor sevenths, harmonic minor triads, harmonic minor sevenths, melodic minor triads and melodic minor sevenths. Ascending, descending and harmonic playing options may be selected before starting the exercise. Scale Identification module includes major and minor scales, pentatonic scales and modes. Ascending and descending playing options are available. Fixed root option may be chosen. In Scale Degree Identification, a major or minor chord progression is played, and a scale degree is heard. The listener is supposed to identify the scale degree. The option of choosing the scale degrees is given. The root may be fixed or not. In Melodic Dictation module, a melody consisting of 3 to 8 notes is played within an octave. The range of the melody may be determined before staring the exercise. Atonal dictation option is also available. After hearing the melody, the first note is given, the listener is supposed to play the melody on the piano. Rhythmic Dictation component provided a sample between 1-3 measures long. Note lengths may be selected before starting the exercise. All exercises are in 4/4 time.   Tempo Identification section an example is played, and the approximate metronome marking is guessed.

Earpeggio is one of the most comprehensive educational ear training applications found in App Store. It is very user friendly and more colorful than the general ear training app. Interval, Chord and Scale Identification modules are very inclusive. Practice reminder option is also very creative and useful. Melodic Dictation module is harder to use and may not be used by students who play instruments other than piano. Tempo Identification module would have been more favorable if the listener identified tempo markings using standard terminology such as andante, allegro adagio rather than metronome markings.   The modules do not have lessons components and they are not organized in progressive style. The student needs the help of a teacher to advance in a methodical fashion while using this app. Earpeggio provides detailed statistics. The teacher may adjust the speed of the progress depending on the capability of the student. Earpeggio may be used effectively in classroom and studio teaching.

MyEarTraining MyEarTraining, Ear Training for Musicians, myrApps s.r.o., 42.5 MB, Requires iOS 9.0 or later. Compatible with iPhone, iPad, and iPod touch, English, Age

Rating Rated 4+, Copyright © 2018 myrApps s.r.o., Price Free, In-App Purchases $5.99[1]

This app consists of two main modules Exercises and Courses. Exercises module is formed of four sections titled Standard, Rhythm, Solfege and Sing. Standard section includes exercises such as intervals, chords, scales, melodies, chord inversions and chord progressions. Each of these sections are divided into multiple sub categories including exercises organized from easiest to the hardest. This is the most comprehensive section of the app. Rhythm section is formed of two bars or one bar rhythmic dictations. Note values used in these examples are arranged from easier to harder. Solfege section has two sub sections Single Note Solfege sub section in which the student identifies single tone played in a tonal context. In, Solfege Melody section, short tonal melodies formed of three to seven notes are supposed to be identified. In Sing section, second note of a given interval is sung by the student. First, student's voice range is determined using the microphone of the device. Exercises are arranged from easier to harder. In Courses available in free version the student may study Intervals and Chords courses before starting the exercises. Playing speed of examples may be changed in the settings. Also, a study time may be set in the settings. This would give the student a guideline for practicing.

MyEarTraining is a very comprehensive app which may easily be used by the student, because each module contains sub modules including exercises organized from easier to harder. The app is designed so that the exercise statistics are synchronized automatically into the cloud. Teachers may monitor up to five students for free using the mobile technology. There is a charge to monitor up to 20 or up to 50 students. The application uses simple graphics. The font used in sub sections is small so using an iPad for this app may be more appropriate. This app may be aimed for the older margin of the target group. MyEarTraining may be recommended for the more studious and goal-oriented students.

Apps in Game Format

Blob Chorus

Blob Chorus Ear Training, eChalk Ltd, 26.2 MB, Requires iOS 9.0 or later, Compatible with iPhone, iPad, and iPod touch, English, Age Rating Rated 4+, Copyright © eChalk Ltd, Free or $0.99 depending on the country

This is an app designed for younger children. The aim of this game is to find the blob who sings the same pitch at the king blob. There is an option to choose from 2 to 8 blobs. If the student finds the blob correctly than points are earned, otherwise the incorrect blob pops. Each game is formed of ten questions. A total score is provided at the end of each session, but a general progress report is not available. The popping effect of Jell-O like blobs are very entertaining for younger children. it is a fun game

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[1] https://myeartraining.net/

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for improving musical memory and the ability to match sounds. It can easily be added to the end of a lesson period. The colorful graphics and Jell-O like blobs are liked by younger students.

MemoMusic

MemoMusic, Rregory Brauge, 12.6 MB, Requires iOS 7.0 or later, Compatible with iPhone, iPad and iPod, English, Age Rating Rated 4+, Copyright © BRF Solutions GmbH, Price Free

It is a sound matching memory game app in which the player tries to match the notes. Each game presents twenty circles on the screen of the device where the player is supposed to find the matching notes by tapping the circles on the screen. There is option of showing the note names in English or in solfege syllables. All 12 chromatic notes are used. The notes may be played by piano, guitar, marimba and clarinet. Concert pitch is used for the clarinet sound. Only one person can play the game. Each game is timed but a score board is not available. There is not a competitive option where two players may compete against one another. It may be played with younger students. It has very basic and simple graphics. MemoMusic may be recommended for younger beginners to develop music memory.

Mussila

Mussila, Learn Music Faster, Rosamosi ehf., 135.8 MB, Requires iOS 7.0 or later, ompatible with iPhone, iPad, and iPod touch, English, Age Rating Rated 4+, Copyright © 2017 Rosamosi ehf. Free http://www.mussila.com/apps/

It is an app designed in a game format used in many other game apps. Aim is to complete a road formed of different modules. Each module consists of questions about instrument recognition, rhythmic recognition, melodic recognition and melody playing. The player must pass a module by at least receiving one star. After completing several modules, a fun module with Mussila band appears where the player may assign different instruments to the band and listen to the Mussila songs. In these sections, it is possible to combine and to hear different combinations of sound. In instrumental sections, the student gets familiar with the sound of each instrument and learn to recognize instruments and the combination by their sound. In the rhythmic sections, the drummer character on the screen plays a rhythmic motive, two options are given at the bottom of the screen. The player tries to identify the correct choice. A student should be familiar with dotted noted values as well as the sixteenth note values to do well in these rhythm sections. In melodic recognition modules, one of the characters perform a short melody. The aim is to identify the correct one out of two options presented at the bottom of the screen. It may not be suitable for the very beginner. However, for student who are already familiar with melodic and rhythmic ideas, this would be a wonderful application to make the bond between the score and hearing stronger. In other modules, a short melody is played by one of the characters and the notes are shown at the bottom of the screen. The

player must repeat the melody on the piano on the bottom of the screen. This section is difficult to complete for students who are not familiar with piano. This section may be better performed on an iPad since the piano keys are too small on an iPhone. This is a fun app with colorful graphics and cool screen characters that may be attractive for most children. It may be beneficial for advancing listening skills of music student in areas such as recognizing the sound of instruments, recognition of rhythmic and melodic patterns. It may be played by younger students, but it may be more suitable for students who have a certain knowledge of notes and rhythmic values as well as who are familiar with piano.

Piano Ear Training - SimonSays Says

Piano Ear Trainer - SimonSays, Gregory Moody, 27.4 MB, Requires iOS 9.2 or later, Compatible with iPhone, iPad, and iPod touch, English, Age Rating Rated 4+, Copyright © 2008 Creative Music Ventures, Price Free, In-App Purchases $0.99

This is an app containing four modules titled Practice, SimonSays Says, Relative Pitch, Perfect Pitch and Intervals. In Practice module, the player is supposed to repeat a succession of notes in increasing length using the piano on the screen. SimonSays Says module is the the faster version of the Practice module. In Relative Pitch module, only the first note of the melody is given. The student is supposed to play the melody by ear on the screen. In Perfect Pitch module, none of the notes are shown on the piano. The player is supposed to hear all the notes starting from the first. If the user signs up to the game center, the scores are placed in the Leaderboard. Intervals module is restricted in the free app. The student may only listen to the chosen intervals.

This application is only suitable for students who can play piano. The graphics are colorful. Practice module may be used by younger students to develop musical memory and a sense of direction on the piano. Relative pitch and Perfect Pitch components are more suitable for students with prior ear training experience. This app is better used in an iPad because piano keyboard is small, and it is difficult to hit the correct notes even on an iPhone Plus. It is fun game app to develop music memory and pitch recognition.

Discussion & Conclusion

There are many educational IOS based apps regarding ear training available in App Store. For the above study, about 60 free apps were downloaded. Completeness of content, educational value, user-friendliness, quality of sound and graphics as well as age rating (4+) were taken into consideration during the initial elimination process. As a university instructor and as a piano teacher whose been actively teaching for twenty years and who enjoys incorporating digital technology into my teaching practice, my personal view also played a role during final selection of these apps.

The above analysis shows that some of these apps are very comprehensive and may appear as helpful tools in supporting aural training of music students. Many progressive schools incorporate mobile devices into study. A design research in K-12 education shows that teacher support equipped with guided use of apps encourages higher levels of reflection on the part of the student than the use of apps alone (Leinonen et al., 2016). Viewing digital technology as revolutionary tool to change the educational system may be flawed since technology may not have the inherent power to change learning practices (Blackwell, Lauricella, & Wartella, 2014). The role of the teacher will not be weakened as many of the apps analyzed above requires the involvement of the teacher for creating a curriculum and for monitoring the progress of the student. The apps may prove important tools for supporting music education given in music class and in private studio. Despite the fact that most music teachers own mobile devices such as iPads and iPhones; a study shows that mobile technology is not widely used in teaching aural skills. The reasons for not including this technology may be inexperience, unfamiliarity and lack of time for finding an appropriate app (Pomerleau et al., 2017). As Domingo & Garganté states more elaborate research may be recommended on the use of apps in specific curriculum areas and educational concepts (2016). If there is more specific information about the educational value of available apps, then more teachers may be willing to introduce digital technology into music teaching. If more teachers are convinced in the educational power of digital technology, then they may encourage parents to use mobile devices as learning tools.

There are several available educational IOS based apps which may be used to support ear training skills. Many of the suggested apps have very inclusive content with user-friendly features. Most of them require teacher guidance to be used effectively and they are geared toward older music students. One of the challenges of the teacher is to motivate the student to use these apps outside of the studio or classroom. Since these apps are not in the game format, especially younger students may lose interest and not use the apps. In that scenario, parental guidance and encouragement becomes valuable.

Among the numerous IOS based ear training apps found in App Store, not many are designed for younger children. Only a limited number of apps with restricted content are offered in this category. Considering that music education is part of most pre-elementary and elementary school curriculums, it is surprising to see that there are not many ear training apps available for younger children. There is need for more apps in this cathegory with educational and entertaining content, colorful graphics, high sound quality and exciting musical excerpts which can attract and keep the attention of younger children. This is certainly a section of the IOS based app market that requires more attention from educators, researchers and game developers.

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