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SOLFY: AN INTEGRATIVE SOLUTION FOR PROMOTING MUSIC LITERACY IN GENERAL EDUCATION

Abstract

Singing is part of music curricula in all countries and can lead to tremendous emotional, cognitive, physical, and social health benefits, bringing joy to singers and audiences. In addition, learning and practicing Solfege opens the doors to music literacy for most students who do not have the privilege to receive paid private music lessons. Solfy is an interactive software program, artificial intelligence-based, that includes technological innovations in singing synthesis & analysis and machine learning, together with new music learning methods (besides others proposed in the past by Kodaly, Orff, or Dalcroze). Solfy *sings* Solfege from digital scores, *listens*, *records, appreciates* users' performance, gives *feedback,* and *keeps progress records*. It will help teachers, students (and parents) practice singing from the score – especially outside the class, without any additional musical instrument. Learning to sing Solfege is equivalent to learning a new language: in our case, the (*intimate*) language of (*western*) music.

It is an aid for music teachers and general teachers in approaching this subject locally or remotely and is especially effective as an interactive tool for students to practice Solfege

individually at home. Practicing solfeges with Solfy at home, 30+ minutes a week, may add many hours of individual guided works on music to the education system – without requiring a particular budget for that. In addition, it can develop the musical ear, singing from score skills, paving the way to music literacy, and helping reduce verbal aggressiveness in day-to-day communication – that can facilitate reducing physical violence. Finally, Solfy allows self-practice and auto-evaluation, keeping the user's recordings and statistics, simplifying organizing, monitoring, and coordinating music literacy progress worldwide in general and vocational education.

Keywords: music education, music literacy, singing, solfege, artificial intelligence

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Introduction

"Singing, independent of an instrument, is the real and profound schooling of musical abilities. Before rearing instrumentalists, we must first rear musician."

Zoltán Kodály (in Kremer 2018, p. 9)

Singing and vocal activities could be among the basic music education activities at primary schools (almost) in all countries. They are part of general education and also of artistic education. But in primary/elementary schools, singing is taught and practiced almost only orally, intuitively, by heart, or by the ear. However, less than 15% learn music literacy in vocational schools or private lessons, while more than 85% don't! Using Solfy will change this reality, opening doors to music literacy to those who cannot afford private-paid lessons.

Solfy is a didactic solution, a digital interactive program AI-based, an option to stimulate and update music literacy beginning with the primary/elementary cycle. It is teaching support in the classroom or online and an interactive and integrative study tool for preparing homework, practicing solmization. Solfy is modular and can serve teachers and students from the formal system of education, vocational schools, and Schools for Teachers' Education.

It was presented at the Musicology Colloquia at the National University of Arts "George Enescu" Iași, Romania, in the 2020 and 2021 Editions and at the EAS Freiburg Conference 2021. In addition, the joint article Perspectives for music education in schools after the pandemic written by Music Teachers Associations Network describes Solfy on p. 53-59.

The initial pilot began in Israel at the end of 2019 and spread to other countries, such as Romania, Moldova, Greece, Cyprus, Canada, and the United States, aspiring to have a dissemination rate similar to the Sing Up program - England in 2007. Although still under development, Solfy is in use in schools free of charge (at least until the end of August 2022).

Description of Solfy (https://www.4solfy.com/); registration

Connecting to Solfy, a user will arrive at the *Welcome to Solfy* page, containing a toolbar with two options: *Program* and *Practice*.

The *Program* function does not require the user to register, allows access to all teaching materials without restrictions, allows listening to Solfeges via the "Play" function, and does not allow using the "Record" function.

The *Practice* (solfege) function will provide feedback after each recording. But, it demands users to register, require users to use a headset, be in a quiet environment, and go through the exercises and lessons progressively, as stated by *Solfy* in short text messages.

A new user must register by completing a standard form (using the *Sing In* button).

In addition to the usual registration details for a site (username, email, password, full name), the form asks to mention the type of voice (child or adult) and the native language. In the *Your group/class* section, teachers, or independent users, will choose the *Independent* category upon registration. Next, students will tick the name of the *Group* created and communicated in advance by their teacher. Teachers will contact the Solfy team by email (4solfy@gmail.com) to receive *teacher status*. Those who can prove affiliation with an official educational institution will receive the *teacher status*.

After registration, the student listens to a Solfege exercise in *practice* mode by pressing the "Play" button and visually follows the digital score notes. Then, equipped with the audio headset with microphone, activates the "Record" button and sings the respective Solfege, receiving *feedback* on the performance's quality. Inaccuracies in interpretation, such as note names, intonation, duration, and intensity, will appear in the *feedback* in red. The correct performances will be displayed in green on *feedback* and reward the user with an accompaniment (mentioned as "with Orchestra" and automatically added to the "Record" submenu). The accompaniments were prepared by the composers Bogdan Focşăneanu (Romania, Canada), Michael Dulitsky (Ukraine, Israel), and Inon Zur (Israel, USA).

The *feedback* on score allows the revision and self-evaluations of the present and previous recordings facilitating the comparison between the *Reference* and *Feedback windows*.

The *Review* function will allow users to check the results (the *feedback*) of previous recorded Solfeges in a statistical table and a traditional score. The statistical table shows the exercise's name, the type of audio guide used, the tempo, the number of successful performances, pitch, duration, syllables, and dynamics errors. The traditional score allows to re-play (play-back) de recorded solfege and check the received *feedback*.

The *Adapt to Your Voice* function enables intermediate and advanced users - who already know (basic) music notation - to take a short test. It consists of singing and recording three solfege exercises

designed to help Solfy build an *acoustic profile of the user's voice* and assess the performance as much as possible. In addition, *Adapt Solfy to your voice* (or *Voice Enrollment)* displays the *notes' names* (also) as text to warn the user to pronounce them clearly and firmly.

After receiving the *teacher status*, a teacher will see in the Solfy bar two more functions: *My Students,* which will allow him to monitor and coordinate remotely, asynchronous students' activities and create new groups, and *In-Class*, which will help singing solfeges together with the whole class.

Using Solfy

Based on the teacher's recommendation, pick an exercise for practicing and press *Play*. Follow the notes on the screen and listen to the Solfege several times through a speaker or headset. Once you feel ready and are in a quiet environment, press the *Record* button, listen to the metronome and the guiding sounds through the headset and sing the Solfege into the microphone. Several seconds after the recording, the feedback will appear in a new window.

The *Record* button has a few options for recording: *with MIDI+beats* (instrumental guide + metronome); *with Beats* (only with metronome sounds); *with Orchestra* (with an excellent accompaniment that is active only after "winning" the option – its means after a successful performance of solfege); *with Mute* (without any audio support from Solfy, but only visual support). Errors in singing will appear in red. There may be errors in the name of the note, pitch, duration, and intensities of the sung notes. If necessary, you can listen to the exercise repeatedly following the marker and perform it again for improvement. If the *feedback* is entirely green, the user's singing is correct. After correctly performing the exercise, Solfy will play the performance with a musical accompaniment (the *Orchestra*) as a "reward" for the successful performance.

Implementing Solfy in schools

Solfy proposes to enthusiastic and passionate teachers from general and vocational education first to test the program, become familiar with it, then implement it in their classes. Advantages of implementing the program in (primary) schools:

- For the teacher – interactive and integrative didactic materials progressively organized, the ability to remotely monitor and coordinate students activities asynchronous.

- For the student - individual practice at home, immediate feedback, personal progress, ability to review and correct the works.

- For the education system - practicing outside of school adds countless hours of guided practice to the system, without the need to add an extra budget for frontal hours.

Minimum requirements:

1. Computer, sound card, laptop, electronic tablet or smartphone, internet.
2. Currently, Solfy works on Windows™, Android™, MacOS™, with Chrome™, Edge™ and, Opera™, but not on iOS™ (iPhone and iPad).
3. Headset - a pair of headphones with a microphone near the mouth.

Solfy in the classroom (singing together[3]) **or online - as in the COVID-19 time**

At this time, Solfy has three (more to come) levels of studies, each *Level* having around 26-28 progressively[4] lessons, each with two exercises and two short repertoire songs.

In class, only the teacher use Solfy with a laptop and projector, for approximatively 10 minutes: 5 minutes for singing together with the pupils the solfeges from the previous week, and 5 minutes to explain the new lesson, the new element/concept/subject, exemplifying the new solfeges. Then assigning homework, asking pupils to practice the solfege with Solfy at home, three times a week, each time, at least 10 minutes. In the classroom, the focus is on singing together, while at home, the focus is on individual and personalized practice with Solfy. Next, the teacher will explain how to use the program at home, practicing singing from the score and then singing by heart.

Solfy outside the classroom – at home, for individual study:

The Play (the *Reference)* function displays the notes and sounds of the solfeges; the pupil/s listens, follows, sings with the inner voice, and learns. After listening, when the pupil is ready to perform, he hit the record button. A metronome and an instrumental melodic guide will sound in the headset, giving support in rhythm and intonation. Following the notes visually on screen and listening to the metronome and the audio guide, the

[3] Here is a video with a K-5 class from Romania filmed less than 3 months after the beginnign of the pilot with Solfy. The school director was present in the classroom, filming, and looking happy with the results - **https://www.youtube.com/watch?v=PAyonLNMWJI&t=18s.**

[4] In general, each new lesson adds a new concept, or maximum two simple concepts/notions.

user will concentrate on singing the Solfege on the headset's microphone, with the correct syllable, pitch, duration, and intensity. A few seconds after the recording is finished, the software will display the musical notes of the recorded Solfege and the *feedback* on the accuracy and quality. Accuracies will appear in green and inaccuracies in red.
To move on to the *next Lesson*, students must complete and record all four Solfeges from the *current Lesson*, succeeding in at least one of them. Students who need more practice can repeat the weekly homework to achieve satisfactory results.
Solfy's advantages:

- *Solfy* "sounds" the scores as solfeges sung by a human (synthesized) voice, with the traditional syllables: *do, re, mi, fa, sol, la, si*. Thus, singing Solfege, the user consciously expresses the sonic meaning of the written musical language, proving knowledge acquisition.
- The analysis system provides *feedback* on the interpretation's quality, mentioning mistakes, allowing the user to record again and correct them.
- The user can compare the *feedback* window with the *reference* window to be aware of the differences and insist on correcting them.
- Solfy rewards successful performances with a pleasant accompaniment, creating a feeling similar to the one created by a *public appearance on stage.*
- The teacher decides the frequency of weekly progress, giving only one Lesson (or more) as homework.
- Teachers can prompt pupils to *Practice* solfeges at home in different modes: *Tempo* = 100, *or* 120, *Record with MIDI+beats* (MIDI synthesized melodic guide and metronome), *Record with Beats* (only with the metronome), *Record with Orchestra* (that is possible only after winning this option), and *Record with Mute* (without any auditory support).
- Students can advance independently - accordingly with the time they will invest in practice.
- Solfy is a solution for stimulating music literacy in formal education, and it invites teachers to test it by themselves and implement it in their classes.

Conclusion

Nowadays, we are witnessing that pupils quickly learn the alphabet, the phonological system, digits, numbers, basic operations, and study a foreign language in the first year of primary school. In that case, we can hope and

expect that learning *five musical signs and sounds* with *five different durations signs* values can be quickly assimilated, opening the way for music literacy from the first grade. Therefore, practicing with Solfy will bring satisfaction and joy to pupils, teachers, and parents, giving them the feeling that they are in a chain of *micro-shows,* on the beginning of a new road toward music literacy from elementary.

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