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Albrechtic – Software For Teaching Music Theory

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Abstract
As part of project KEGA 003UKF-4/2015 Application of information and communications technologies in teaching music theory, the research team from Constantine the Philosopher University in Nitra focuses on the development of a new educational software, Albrechtic, to support teaching music theory at all levels of education. The software, which contains basic tasks from the music theory syllabus (notation, scales, intervals, chords), is conceived in two modules (reading notation and writing notation), and reflects all levels of the given topic. The software is being developed for a computer platform (win32 and win64 applications), although after its testing and improvement, research and development will focus on creating new versions for various mobile platforms, so that the program can be used and operated also on a tablet or telephone.

Keywords: music education, music theory, educational software

1. MUSIC THEORY IN THE LIGHT OF INFORMATION TECHNOLOGIES

Computer-aided education is currently a term which has become familiar in several fields of education, including music education. The standard of the quality of computer-aided education is determined by the availability of didactic technologies, by the selection of teaching aids, and by the aptness of the teacher. At the same time, the notion of creativity in the process of education, applied not only from the aspect of the students' creativity, but also from that of the teacher's, has also come to the fore. Creativity, as an especially efficient factor in the development of competences and skills in artistic education, has been emphasized in various studies. (Kokotsaki, 2011; Bújez – Mohedo, 2014; Satková, 2013) While a creative attitude goes without saying in the pedagogy of arts (playing a musical instrument and singing), a conservative attitude is still present in the field of teaching music-theoretical subjects at a lower level of education, combined with its practical application and music making. In general, teaching music-theoretical subjects is considered to be a necessary evil, or even an unnecessity, and several teachers deliberately avoid teaching the basics of music theory and notation in the structure of the lessons. Computer-aided teaching, which has the prerequisites to efficiently develop musical competences and skills, may be one of the creative and, for the students, attractive ways of teaching music-theoretical subjects. Computer-aided teaching is most frequently used for developing intonational and rhythmic skills, and for teaching notation, where the principle of a clear question and answer, that is an exact and rational principle, can be utilized, which is intrinsic in working with computers and computer software. Several studies have already been published about computer-aided teaching of intonation and rhythm. (Brezina, 2012; Brezina, 2014; Brezina – Betko, 2013) At present, several high-quality music programs (Sibelius Auralia, Earmaster, and so on) are available for teachers. However, sophisticated programs to support teaching the basics of music theory (scales, intervals, chords, etc.) are still absent in the field of digital didactic aids. A few educational music theory programs can be found on the internet, but these lack a premeditated concept with a wider scope and emphasis on didactic principles. Sophisticated online applications for teaching music theory include, for instance, www.musictheory.net (for lower level) and www.teoria.com (for higher level), which are localized in English. Since English and Slovak music terminology differ, these are not suitable for music education in Slovakia (except for bilingual schools). Music programs which support teaching music theory secondarily, but their primary purpose focuses on editorial activities, also lack Slovak localization. These are pieces of notation software, which are generally used in practice for creating notation exercises and tests. Interactive work and practising music theory itself is problematic in these programs due to their targeted limitations arising from the primary focus of notation software. Notation processors, such as Sibelius, Finale or MuseScore, are edited in a way so that the user makes as few errors due to negligence as possible. It applies especially for the correct rhythmic division of the notes within the given metre, defined in the software, which cannot be turned off. When practising correct rhythmic notation, the function of automatic assignment of values is counterproductive. Practically oriented, commercial notation processors do not count with the possibility of an automatic evaluation of the exercises, either, nor with other supportive functions of music-educational character. Metrically free, or erroneous, notation is absent in them, which might be efficient for explaining, and mainly for practising, new syllabus. At present, the only full-fledged starting point for teaching music theory is the good old writing on the board (maybe also using a data projector or an interactive whiteboard).

One of the pressing questions of music education is the influence and extent of a meaningful utilization of new communications technologies in education. (Kozel, 2013, s. 24) That is why one of the key tasks of the Faculty of Education of Constantine the Philosopher University in Nitra is to improve the quality of education with an emphasis on improving the teachers' competences and skills with the help of new methods. (Récka, 2013, s. 2; Satková, 2016, s. 164 – 169) The team of professional assistants at Constantine the Philosopher University in Nitra also aims at reacting to the current trends in education and to the state of digital didactic software and, as part of project KEGA, Application of information and communications technologies in teaching music theory, it has decided to create an original software product to support teaching music theory with the title Albrechtic. The aim is to develop a digital didactic aid which could be used in teaching music-theoretical subjects at all levels of education.

Since even the most sophisticated didactic software is inefficient without technically apt and computer-literate teachers, the Albrechtic software will be primarily aimed at teachers and students of universities focusing on the preparation of prospective teachers. However, already practising teachers must also be taken into account, who have been receiving increasing attention recently through trainings as part of continuous education. Information and communications technologies attract an increasing number of teachers even of a higher age, who do not have enough experience with up-to-date didactic technologies and, consequently, do not use them in teaching. In spite of that, teachers' interest in new communications technologies in music education is growing, and it is partly due to the continuous improvement of IT facilities at primary schools, secondary schools and universities (projects like Infovek, Digiškola, etc.). Today, schools are equipped with computer rooms, interactive whiteboards, and even tablets. That is why the development of the didactic software Albrechtic has set not only priorities pertaining to its contents but also technical priorities. These include especially its full-fledged functionality in the user environment of interactive whiteboards and mobile devices (tablets, smartphones).

Teaching music theory belongs to basic educational activities in music education at primary schools, primary schools of art, conservatories, secondary schools for teacher training, as well as universities. Each level of education has its specified scope and specific syllabus for the subject, but principally it is to teach the tonal system and the basic vertical and horizontal relationships between the musical elements. State education programmes (hereinafter referred to as SEP) have developed various contents for the music theory syllabus. SEP focus on the contents of the syllabus about the basics of notation, scales, intervals and chords only for primary schools of art. All the above fields are first taught complexly on the first level of primary education at primary schools of art (years 1 to 3). SEP for primary schools of art at the said level of education presume mastery of reading and writing notation in G-clef and F-clef, mastery of reading and writing major and minor scales with up to two sharp symbols or two flat symbols, and mastery of reading and writing triads in keys of the given scales. In the field of intervals, pupils at the end of year 3 have to be familiar with all the intervals from the prime up to the octave, including their quality. In the second part of the first level of primary education at primary schools of art (years 4 to 7), the contents of music theory education focus on mastering the augmented and diminished intervals, augmented and diminished triads, dominant seventh chords with their respective inversions, and the main diatonic functions. From among the scales, attention is paid to the whole tone scale, chromatic scale and pentatonic scale. (SEP, 1995) Similar course of the syllabus is expected also at the other levels of music education, therefore the software which is being developed has all the prerequisites to be widely used.

1.1 Basic Information about the Albrechtic Program under Development

The Albrechtic educational program, which is being developed as part of project KEGA 003UKF-4/2015, represents a unique software tool meant for teaching music theory at lower, middle and higher levels of schools, and represents a suitable supplement for standard teaching procedures. Combined with an interactive whiteboard, which is a common facility at most schools today, it represents not only a state-of-the-art, but also an entertaining methodical teaching aid.

The Albrechtic program copies the current trends in the development of applications, introduced by state-of-the-art information and communications tools (telephones and tablets), and its environment is designed in a simple way to enable operating all the functions of the software intuitively (even though the program will include a full-fledged help menu for each function) and, mainly, by a touch screen (with regard to its planned interconnection with an interactive whiteboard). At the moment, the software is being developed for a computer platform (win32 and win64 applications), which forms the objective of this project. After the integration of the software into the process of education, and after its testing and improvement, further research and development will focus on creating versions for various mobile platforms in a subsequent project, to enable the use and operation of the program e.g. via a tablet or telephone almost unlimitedly.

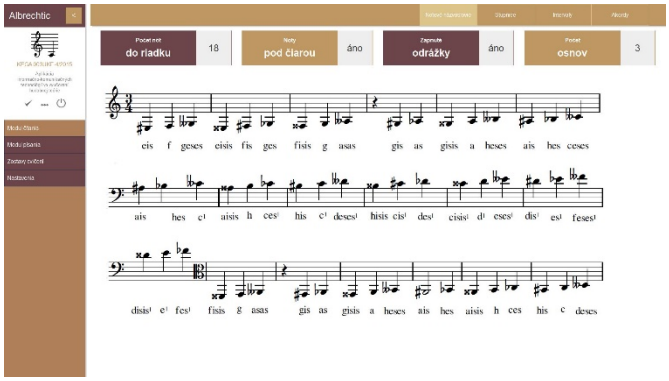

Figure 1: The Albrechtic program environment

The program contains two modules – a **reading module** and a **writing module**. **Notation and transposition**, **scales**, **intervals** and **chords** (upon selecting the specific category) can be practised in each module. Besides basic pieces of knowledge needed for mastering the syllabus on a lower level, the program will be extended by further information from the field of music theory (practising notation for transposing instruments, additional information about C-clefs – soprano clefs and mezzo-soprano clefs, deepening the syllabus regarding scales – medieval and special scales, basics of jazz harmony, etc.). The extended program will be meant for secondary specialized schools and universities specializing on teacher training.

An example of how the program functions is presented in the reading module, in the category of notation terminology (the reading module in the categories of scales, intervals and chords is functionally analogous). After selecting the module and the category, the practiser can first perform various basic settings, e.g. choose the number of bars in the staff, choose the number of displayed staves (in lines below each other), select the clef (G-clef, F-clef, alto or tenor C-clef), which the program places always at the beginning of the staff for each line.

Figure 2: Selection of clefs in the Albrechtic program

Further settings for the exercise (features of the staff) can be performed, e.g. the short ledger lines in the notation can be turned on or off above and below the staff separately for each note).

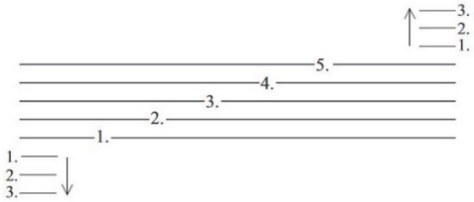

Figure 3: Selection of ledger lines in the Albrechtic program

Time signatures and bar lines for the staff can be turned on or off (e.g. when practising scales in the category of scales, it is good to have the bar lines turned off).

Figure 4: An example of a time signature in the Albrechtic program

Rest symbols and accidentals (single and double) can be turned on or off.

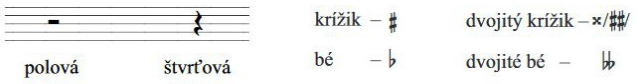

Figure 5: Rest symbols and accidentals in the Albrechtic program

Note values can be set (the program will include basic rhythmic values ranging from a semibreve to a demisemiquaver, and their corresponding rest symbols, including basic irregular divisions of notes – duplets, triplets).

Figure 6: Selected note values in the Albrechtic program

Based on basic and additional settings for generating a staff (or several staves in case a larger number of lines is selected in the basic settings), the program creates a staff with the selected clef, time signature (or without a time signature), algorithm working on the basis of a random placement of the selected type of notes onto the staff (or on the ledger lines), and randomly assigns an accidental to each note placed (or does not use any accidental) within the limits set by the user and the program as such. If, as part of the additional settings, the use of rest symbols has been enabled, these may also occur within the notation randomly.

The staff generated by the program may look like this:

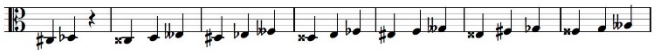

Figure 7: An example of a staff generated in the reading module, notation terminology category, in the Albrechtic program

By clicking on each note subsequently, the task of the practising student is to name each note generated in the staff correctly (a modal window appears after clicking on the note, from which the student selects the correct name, and writes it under the selected note). The names of the notes follow their Slovak terminology, not their English one or the symbols used abroad (e.g. a# = ais [for a sharp], fb = fes [for f flat]). The user can exit the exercise at any time.

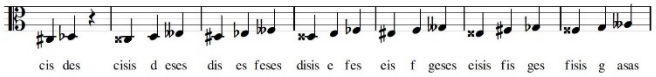

Figure 8: Correctly named notes in the generated staff with regard to the set limits in the Albrechtic program

In the end, the program evaluates the success rate of the practising student, and enables them to name the incorrectly named notes again. At the same time, the practising student can choose to repeat the exercise or can choose an exercise with other settings (e.g. in another clef, etc.).

The writing module is the "opposite" equivalent of the reading module. After defining the basic and additional settings, the program creates a staff in which the generated notes are hidden.

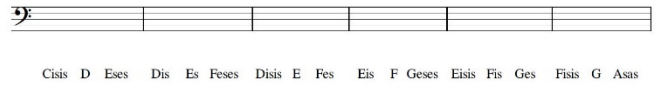

Figure 9: A generated staff with hidden notes in the writing module with regard to the set limits in the Albrechtic program

The task of the practising student is to select (define) the place and the accidental, if any, of the note from the individually displayed modal window by clicking on the staff above the name of the note.

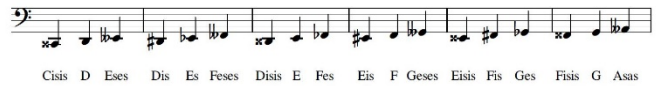

Figure 10: A generated staff with notes in the writing module with regard to the set limits in the Albrechtic program

After placing and specifying all notes, the program again evaluates the success rate of the practising student, who may repeat the exercise, or do it again with other settings.

As part of this project, the development of further, additional functions of the program is also planned, e.g. so that the performed exercise could be saved for further analysis of the mistakes which the practising students often make, to modify the teaching method accordingly, or to realize which part of reading and naming the notes the students are least familiar with. An option to create various sets of exercises in advance by the software administrator (who is most often the teacher with a special authorization for the program) also appears to be a possibly useful function, which could be used mainly in the categories of scales, intervals and chords (with creating divisions and overviews), with the option to specify and describe them. Gradually, the software will be supplemented by a

module for rhythmic exercises and, connected to a midi converter, the respondents' audio experience can also be developed.

We believe that the Albrechtic software, being developed as part of project KEGA 003UKF-4/2015, can be generally applied for teaching music theory, and will become a suitable supplement for each teacher in integrating information and communications technologies into the teaching process, as well as for the students in practising the elements of music theory and gaining a deeper insight into theory as such. Besides its variability, an undoubted advantage of the program under development is the possibility to increase the efficiency and speed of the teaching process, its overall plan and connection to an interactive whiteboard, and the possibility of an immediate feedback. When solving a problem, the student gets the answer immediately, with a methodical possibility of correction in the case of mistakes in the progression, they can practise anywhere (not only in the classroom at the school), and practically do not need a teacher, who is in part replaced by the Albrechtic software itself; the student is thus able to master a larger number of exercises, and is more motivated to work.

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