# A new e-Learning Resource to Support Music Education in Romanian Schools

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**Abstract:** The pandemic has demonstrated the need for e-learning tools to support Romanian music education. The lack of digital resources in the national language adapted to the Romanian music curriculum made it difficult for students to learn using foreign applications with a different music notation system from Romania's during the online teaching period. In response to this, we created a software tool that supports musical instruction in line with the outcomes expected by the country's school music curricula. This study investigated the effect of the new software on improving learning outcomes and student motivation. The participants were three experimental groups from eight schools. Group A (n = 60 pupils) were required to use the software for six weeks, at least 15 minutes per day, five days a week. This was carried out under teacher supervision in classrooms and under teacher guidance at home. Group B (n = 61 pupils) were asked to use the software once a week for six weeks in their music lessons. Group C (n=10 teachers) lead the application's testing process. Each child was allocated a unique code (to ensure each pupil's anonymity), which enabled the researcher to observe their activity. The average total use per child in Group A was 48 sessions, and for Group B, it was 12 sessions. The results for Group A showed pupils had notably enhanced their learning outcomes. Of the (n=60) pupils, 96% reported feeling 'highly motivated' by the software. The tool's facility for personalised, needs-focused exercises with immediate feedback was identified as particularly helpful. Group B, who used the software occasionally, made slower progress, but 93% reported that the addition of the software was preferable to traditional classroom music education conducted without such individual-focused technology. Out of (n=121) pupils, 94% reported the software was easy to learn and use. Each of the ten teachers who led the testing process reported increased accuracy of the elements practised with the software after six weeks of usage and decided to continue using it. More exercise resources are currently being developed for the software. Now also in English, it is easily translatable into other languages.

**Keywords:** ICT integration, music education, digital resources, music technology, music software

## 1. Introduction

The evolution of digital technology with its applicability in any field has brought significant improvements in education and research in many parts of the world (Klasnja-Milicevi, 2018). Multiple research projects in the education field have shown that the use of technologies in the teaching-learning-assessment process has raised performance to a higher level, increasing the students' levels of satisfaction and generating a more positive attitude in the classroom (Condie et al., 2007; Innes, 1997; Savage, 2007). One of the positive influences on the learning process observed from the use of music technologies is that students become more receptive to study by becoming active participants (Valdivia et al., 2021). Following a project involving the use of music technology in music classes, Louise Cooper (2017) reported that students became highly focused on technology-mediated projects, with even those students with difficulties being motivated and engaged in sustained work when they used the technology. It is well recognised that one of the advantages brought by technologies into education is the possibility of immediate feedback. Learners and teachers can then properly adjust the learning process and enhance learning outcomes (Tacoma et al., 2020; Wong et al., 2017).

Savage (2017) mentions the role of technologies in music as a support in listening to, understanding, performing, and composing music. Harding and Ward (2020) state that music technologies help teachers offer a cross-curricular approach to music education, which the Romanian music curricula have requested since 2017 (MNE, 2017. They state that technologies facilitate the embedding of aspects and knowledge from other disciplines, such as literacy, numeracy, mathematics, history, poetry, and IT, and so are also useful tools for teaching STEM subjects (Science, Technology, Engineering, and Mathematics) (Harding et al., 2020). Kirkman (2009) offers a unit of work as an example of a cross-curricular approach to teaching music that transcends the traditional boundaries to which Romanian pedagogy has become accustomed. This approach offers students the opportunity to access a relevant and captivating music education that embeds information from history, geography, law, and other subjects in the music classrooms.

Undoubtedly, new music technologies have changed the traditional teaching, learning, and assessment approaches, embracing a new world of performance, composition, listening, and understanding music.

Moreover, this empowerment by new physical and virtual tools and instruments can democratise the musical field. Nowadays, education without technology seems incomplete and limited.

With the advent of E-learning tools, new opportunities for teachers to provide differentiated learning without feeling overwhelmed has become available. In 2009 British Educational Communications and Technology Agency (BECTA) & National Association of Music Educators (NAfME) stated that electronic learning environments would help teachers to offer differentiated educational experiences according to the pupil's ability. It stated that ICT tools support music teachers in modelling the musical concepts they teach (BECTA, 2009). With technological support, students can learn from where they actually are, not from where the support age textbook or curriculum says they should be. Technology increases the teacher's opportunities to teach and assess students in several ways at the same time, thus responding to the diversity of students in the classroom (Elmahdi et al., 2018). Differentiated instruction can enable students to progress at their own pace and empower them to become lifelong learners. A differentiated learning approach avoids the levelling of students in education, motivating them more to progress (Palieraki et al., 2021).

## 2. Background

While countries such as Great Britain have made use of technology in music education since 1992, when ICT was introduced in their National Curriculum for Music, the Romanian music curriculum did not mention technology until 2017 (HMSO, 1992; MNE, 2017). As Tim Cain (2004) states, curriculum changes are necessary for the classroom to keep up with the outside world.

Since 2017, Romanian music teachers have been expected to find and choose the right E-learning tools to support their teaching. However, at the beginning of 2022, it is still a challenge for current Romanian music teachers to make appropriate use of ICT to help pupils develop their musical skills, knowledge and understanding. Issues of access, training and quality remain ongoing. E-learning resources for music teachers in the state school system are still limited or inadequate, with low support for music-specialist and non-music specialist schools. The current curriculum recommends using training applications that use the alphabetical notation systems and terminology of Anglo-Saxon countries, while Romania has always used the syllabic notation system and its own terms to define music elements (MEN, 2017).

The global crisis caused by the COVID 19 pandemic has accelerated the necessity of introducing music technology to the music education field, especially during the distance learning period. Teachers struggled and lacked the experience and time they needed to conceive new ways to deliver instruction and assignments. Students' learning paths and progression were disrupted. Suddenly E-learning tools were not an option anymore but a necessity. During the pandemic, the positive impact that information and communication technologies have brought into education, has made clear to Romanian music teachers the importance of knowing and efficiently using the available specialised technologies. The current generation of music teachers has become more willing to exploit existing technological possibilities and create new e-learning resources to support music education. The scarcity of music technology in the national language has made evident the need to create, introduce and apply innovative, intelligent e-learning tools adapted to students' needs and to the outcomes required by the Romanian music curriculum.

Research conducted at the end of 2021 related to the current use of music technologies in Romanian primary and secondary music classrooms showed that over 70% of the 170 teachers who completed the survey had never used the type of music software specified in the curricula. About 20% used it only occasionally during the online teaching period (Moldovan, 2022). The main barrier to using ICT during the teaching-learning assessment process reported by teachers was the lack of instructional software in the national language and the lack of teachers' training in use of music technologies.

In response to the current situation, we created *CantaCuMine* (https://www.cantacumine.ro/), a training software to support teachers in updating their practice in line with the outcomes requested by the current curricula (NME, 2017; NME, 2004; NME, 2005). The software is unique in Romania, designed for both music-specialist and non-music-specialist schools. The software addresses all the three pre-university levels: KS1 (year 1-4), middle school (year 5-8) and high school (year 9-12). It was used during the pandemic, and new resources are currently being developed to provide further support for music teaching.

Starting from the observation that the United Kingdom is one of the countries that have successfully used music technology in schools for a long time, we thought that in some aspects, it might be a source of inspiration and a model in the process of innovation that is imperative in the new educational context in Romania. The current music technology used in the UK education system described on the Incorporated Society of Musicians website, was an inspirational source for the study's software creation (ISM Trust, Table 5.1.; ISM, 2020; Becta&NAfME 2009; Fautley and Daubney, 2019).

In this study, we report on staff and students' experiences using the new software, discuss lessons learned, identify some of the problems that arose, and propose ways to address them.

The primary contribution of this paper is a case study from 8 schools in the real-music classroom showing how a group of students can be taught with the support of the *CantaCuMine* e-learning tool to promote and encourage active learning.

## 3. New technology - an alternative approach

This study aims to encourage a new teaching pattern adapted to the requirements of the new realities of music education by changing the current passive learning style in Romania. The experiment considered the use of the newly created music instruction software in primary and secondary classrooms.

In traditional music classrooms, only a small number of students participate actively: one student at a time has the chance to answer the teacher's question, while most others are passive. The instruction software trialled in this study allows the children to work simultaneously on different exercises depending on their needs and on their previous learning acquisitions. Using the software, the students benefit from practising out of school, when and where they choose, with a virtual teacher who provides instant feedback after each exercise. Through the instant feedback, the pupils' strengths and weaknesses are identified, making them aware of what they need to practice. For teachers, the materials are easy to use and to store, and this allows them time for better lesson planning. Exercises for which dozens of worksheets and many hours of marking were needed before can now be accessed and replaced, from a single page, as seen in the following image.

**Figure 1:** Pupils accessing exercises with all music intervals from a single web page

The software structure was planned to include a theoretical component-music theory training, an instrumental class tuition component, and a composition part. *CantaCuMine* software is currently developing resources for the instrumental class tuition and composition, two new aspects introduced in the Romanian music curriculum in 2017 that Romanian teachers seldom engage with.

The results we tracked are presented after using the theoretical part of the software, which currently includes five applications that can help students learn the following: music notes in four clefs, music intervals, music chords, keys signatures and degrees in tonalities.

## 4. Methodology

*Sample:* The research sample consisted of eight schools from different Romanian towns. Collaboration was with teachers in primary and secondary music-specialised schools who expressed their desire to use the instructional software during the music lessons. The schools involved in the experiment give a representative sample of large and small state schools.

*The participants were 121 pupils and 10 teachers:* The students were divided into two groups:

- Test group (group A) :(n = 60 pupils) - used the software under teacher supervision during their school music lessons for six weeks. In addition, they were required to use the software for practice at home, at least 15 minutes per day, five days a week, under teacher guidance.
- Control group (group B) :(n = 61 pupils) - used the software once a week for six weeks of school music lessons.

These two groups were balanced as much as possible in terms of the number of students involved. The teachers considered pupils' prior knowledge and abilities, so both groups were of a similar level in each school in terms of knowledge. Student scores obtained in the practice tests led by the class teachers measured prior knowledge and skills.

At the beginning of the testing period, each child was allocated a unique code (to ensure anonymity), which enabled the researcher to observe the students' learning progress during the experiment.

The distribution of codes by teachers to students has remained confidential, with no access for the researcher to any code associated with a particular student. Group A received the access code at home, while group B was advised to use it during the testing period only in the classroom.

## 5. Findings

This study demonstrates that the first group, which used the tool constantly for six weeks, learned better than group two, which followed the traditional learning paradigm for home practice and used the software only during their music lesson. The access codes were distributed as shown in Table 1.

**Table 1:** Codes access distribution in schools

| *Town* | Bucuresti | Sibiu | | Deva | | Sighet | Botosani | Braila | Vatra Dornei | Reghin |
|---|---|---|---|---|---|---|---|---|---|---|
| | | *T1* | *T2* | *T1* | *T2* | | | | | |
| *n=group A* | 7 | 7 | 7 | 8 | 8 | 5 | 5 | 5 | 4 | 4 |
| *n=group B* | 6 | 7 | 7 | 7 | 7 | 6 | 5 | 5 | 5 | 5 |

This distribution might not be ideal for the following reasons:

- Some students from the control group (n=3) frequently accessed the platform at home starting with week two and could not be assigned to an arbitrary group due to the number of times they accessed the software.
- There were some students in group A (n=2) who did not access the software regularly and had provided less data than required, so these were not taken into account.

*Means of data collection:* An online questionnaire with open and closed questions to collect both quantitative and qualitative data was designed for all the ten teachers in each school. At the end of the testing period, all 121 students who participated in the software testing were also invited to answer a set of questions. Their answers reflected their opinion on the software and the advantages and limitation observed. The main tracked data that reflects the students' activity was extracted through the access codes that had enabled the researcher to observe their use of the software.

## 6. Experimental setup

The software was presented at the beginning of the experiment to the teachers involved. They received some instructions on how to use the software but reported that the software is intuitive, and no special training is required. The next step for teachers was to plan their lessons with the software for six weeks. Each teacher approached during the music lessons the application/s they needed according to the subjects taught during the testing period.

**Table 2:** Applications approached by each school

| *Town* | *Applications approached* | | | | |
|---|---|---|---|---|---|
| | Notes | Intervals | Chords | Key Signatures | Degrees |
| Bucuresti | | x | x | | |
| Sibiu | | x | x | x | x |
| Deva | | x | x | x | x |
| Sighet | x | x | | | |
| Botosani | x | | | | x |
| Braila | | | x | x | |
| Vatra Dornei | x | | | | |
| Reghin | x | | | | |

The experiment involved teaching one music element of new material and immediately giving the learners related exercises to practice. This approach enabled teachers to work with a new pattern of teaching, which was beneficial to both students and teachers. Learners could test their understanding of the taught concepts straightaway. Based on students' answers, teachers could measure the level of understanding of the taught material. Mixing theoretical explanations with interactive exercises benefits long-term recall. During the testing period, we followed the pattern shown below.

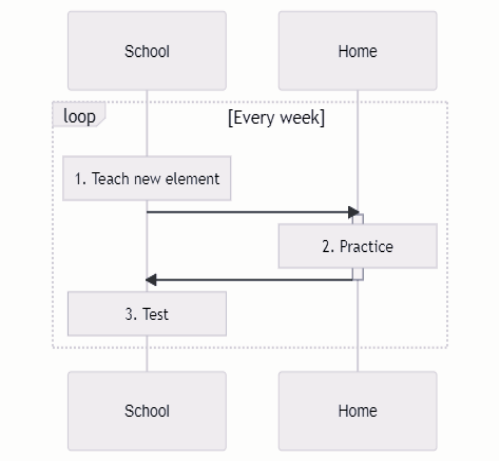


**Figure 2:** The pattern followed during the six weeks of testing the theoretical part of the software

In the first week after the software presentation, pupils were taught new element/s during the music lessons according to the music syllabus for their year group. Groups A and B were invited to use the platform during the lessons to practice the new element/s under teacher supervision. Group B mixed traditional methods (worksheets) with the software during the music lesson, while group A used only the software for practice. All 121 participants could practice the exercises individually during the class and access a test when they decided to check their progress. Group A was asked to use the software for at least 15 minutes per day, five days a week, for home practice. Group B followed the traditional method and received worksheets that covered exercises for about 15 minutes plus some challenges for those who wanted to work more. At the beginning of the second lesson, pupils tested their knowledge from their previous lesson of the week before and were then taught a new lesson/element which was practised using the software in groups as described above.

The tests were structured in packages of ten. After completing each question, all the students had instant access to the test results, which showed them exactly their weaknesses and strengths, pointing out which elements they were still missing and needed to work on to progress. This pattern was held for the whole period of six weeks.

Firstly, it was necessary to see if the number of correct answers during the performed tests every week for both groups was identical or not. If the results were similar, that would mean that *CantaCuMine* software had not introduced any changes. Then the final tests were analysed. These included all the music elements taught and practised during the testing period with *CantaCuMine* software. These tests helped compare the two groups' final performances considering all the elements they had practised during the test period. It should be

noted that new elements were added to the previous ones every week. So, all tests included all the elements taught during the weeks since the experiment had started.

## 7. Results

The following diagrams show the average mark from the whole of each group

### *7.1.1 Notes training application*

Group A's average answers were between 8.47 and 9.07, while group B's average answers scored between 6.33 and 6.72, as shown in the following diagram.

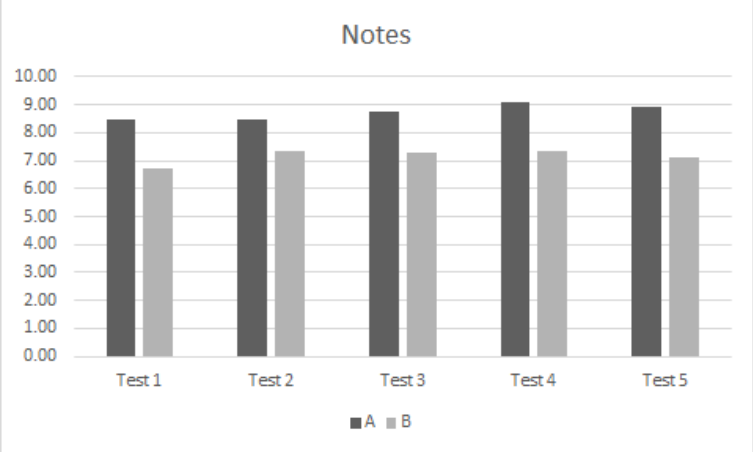


**Figure 3:** Pupils' average correct answers in the tests performed during the six weeks with the note training application

### *7.1.2 Intervals training application*

Group A's average answers were between 8.43 and 9.07, while group B's average answers scored between 6.61 and 7.18, as shown in the following diagram.

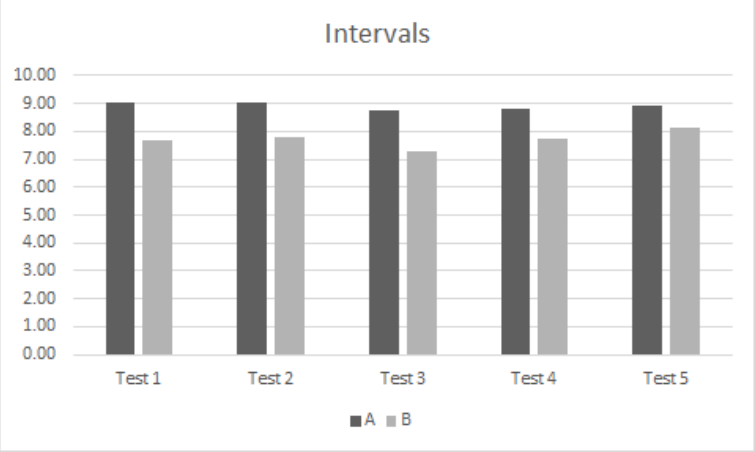


**Figure 4:** Pupils' average correct answers in the tests performed during the six weeks with the intervals training application

### *7.1.3 Chords training application*

Group A's average answers were between 8.43 and 8.60, while group B's average answers scored between 6.37 and 6.66 as shown in the following diagram.

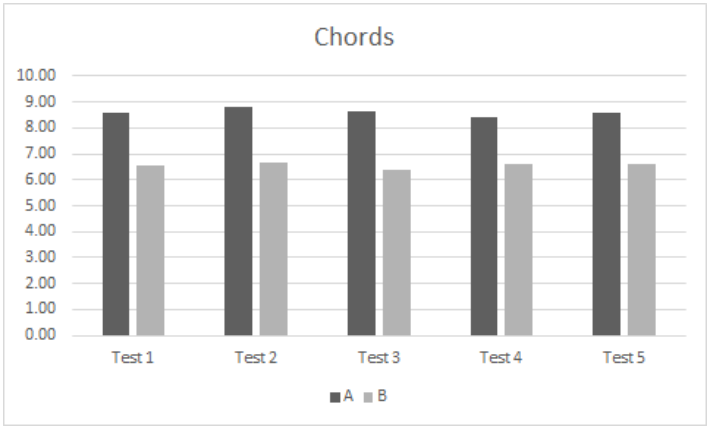


**Figure 5:** Pupils' average correct answers in the tests performed during the six weeks with the chords training application

*7.1.4 Key signature training application*

Group A's average answers were between 8.49 and 9.30, while group B's average answers scored between 7.88 and 8.93 as shown in the following diagram.

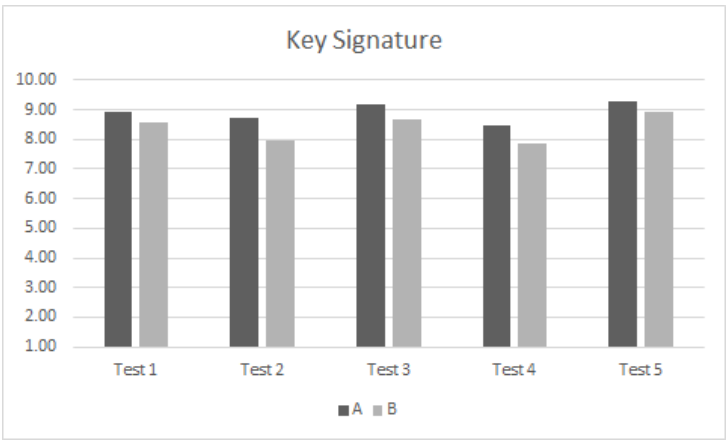


**Figure 6:** Pupils' average correct answers in the tests performed during the six weeks with the key signature application

*7.1.5 Scale degrees training application*

Group A's average answers were between 8.26 and 8.67, while group B's average answers scored between 6.87 and 7.75 as shown in the following diagram.

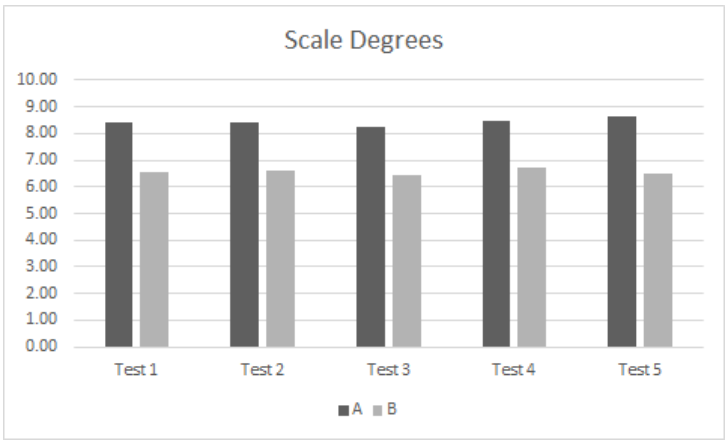


**Figure 7:** Pupils' average correct answers in the tests performed during the six weeks with the note training application

## 8. Staff and students' experiences using the software CantaCuMine

In the questionnaire completed by the students who participated in the software testing, 100% of the 121 reported that they enjoyed the experience of using the software during the music classes and said that they wanted to continue to use the software in their home practice. 96.6% reported that they felt highly motivated by the software marking with 5 on a scale of 1 to 5, their motivation and active involvement through the software usage. 97.5% considered that their being able to choose the exercises (according to their needs and previous learning acquisitions) was extremely useful. 98.3% of students in Group A considered it an excellent opportunity to practice where and when they chose. The 121 students unanimously appreciated the possibility of accessing immediate feedback. 94% reported that the software was easy to learn and use.

The ten teachers who managed the software testing reported that the software offered the opportunity to better plan the time allocated to the acquisition of the musical elements they wanted to cover. All ten teachers noticed improvements in students' knowledge following the use of the software during the music lessons. They all reported better results in students who practised at home with the software compared to those who continued to work at home with traditional methods. Teachers stated that the software was not only helpful in teaching but also to motivate them. "I saw them captivated and eager to work with technology. The software totally aroused their interest", reported one of the teachers. "They are eager to achieve a higher score than the previous one; have a higher motivation and a great pleasure to continue training themselves with the software", reported another teacher. Eight of the ten teachers involved remarked that the software engaged students in peer learning, noticing that the exercises generated group discussions. Six teachers reported that students perceive the exercises as games and reported that the software offers students an attractive and dynamic learning environment. "Students are more focused, enthusiastic, and eager to learn", reported another teacher.

All the teachers confirmed that the new teaching approach raised their awareness of each of their students' levels of comprehension of the taught material, helping them adjust their teaching process. "I had continual feedback from the students, so I knew exactly which activities I should insist on", reported one of the teachers. "I was able to adapt things on the go knowing what the students understood and what they didn't", reported another teacher. All the teachers involved in software testing decided to continue using the software during school music lessons and home practice.

*CantaCuMine* software is also proposed to support active learning educational scenarios, including online teaching or a hybrid approach. During the six weeks of the experiment, three of the pupils from group A who missed a lesson in person due to illness were able to connect on the Google classroom platform to access the lesson they had missed. They managed to do the expected exercises on the software during the hybrid lesson. In addition, they could keep accessing the software at home for 15 minutes following the teacher's explanation.

## 9. Conclusion

Innovative approaches to digital devices can make learning more attractive and improve learners' performances. The involvement of music technologies in music education has opened new opportunities for the current generations of Romanian music teachers.

Following this experiment, we can conclude that the use of the *CantaCuMine* software enhanced students' learning outcomes, positively affecting learners' motivation. Students became more eager to learn, more enthusiastic, and more focused when using technology-mediated music education.

The use of pilot schools in which students and teachers test the newly created resources to provide immediate feedback on the content is ideal. In this way, adjustments can be made following constructive discussions regarding the contents and its display.

Starting with the next academic year, the software will be offered for widespread use in Romanian schools.

At present, *CantaCuMine* software develops resources for instrumental class tuition and composition; the next step in our research is to test and track the results of using them in a larger potential sample of school settings. We also intend to continue developing and testing more applications for the theoretical component in the

future. Undoubtedly, the positive effect of technology on music education in Romania will increase as technologies are developed and used responsibly and maturely. In this way, the current generation of teachers will expand the traditional opportunities for students to engage in music.

***Some Fears and Misconceptions***

Many teachers fear that computers can take away the teachers' role in the future and therefore they dismiss their use out of hand. In so doing, they and their students may miss on the potential benefits. This is compounded by a vague idea that computers will de-humanise and take over the relationships with their classes and students they have enjoyed for many years. The teachers who want to incorporate technology in their teaching-learning-assessment process can potentially benefit from good quality support in their training. More than this, the teachers involved in this project reported that this tool opened their minds to consider the teaching and learning process in previously unexplored ways.

Following the results we tracked during this experiment, we decided to translate the software into English *AllegroNotes* (https://www.allegronotes.com/) so more pupils could access its content.

***Limits and challenges***

There were situations when computers met internet connection difficulties in class, and teachers had to either restart the computer or offer the pupils another device. Although the software was built with a responsive design, the display for devices less than 7 inches is not recommended due to the number of elements needed to be shown on a page. Some of the pupils accessed the software from mobile devices for their home practice and noticed the inconvenience in the display.

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