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# Table of Contents

<table>
<thead>
<tr>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Table of Contents</td>
<td>7</td>
</tr>
<tr>
<td><strong>Keynote address</strong> Music technology: production and participation</td>
<td>13</td>
</tr>
<tr>
<td>Ian Cross</td>
<td></td>
</tr>
<tr>
<td><strong>Keynote address</strong> Singing synthesis and the Vocal Tract Organ</td>
<td>15</td>
</tr>
<tr>
<td>David M Howard</td>
<td></td>
</tr>
<tr>
<td>Knowledge, Technology and the transformative process in the</td>
<td>23</td>
</tr>
<tr>
<td>construction of talking drum (dundun) of the south-west of Nigeria</td>
<td></td>
</tr>
<tr>
<td>Timothy Ajiboye</td>
<td></td>
</tr>
<tr>
<td>Online diagnostic measurement of musical abilities in Hungarian</td>
<td>25</td>
</tr>
<tr>
<td>schools – a cross-sectional study of 1st to 11th grade students</td>
<td></td>
</tr>
<tr>
<td>Kata Asztalos</td>
<td></td>
</tr>
<tr>
<td><strong>Performance Methods for the Interpretation of Tape Music</strong></td>
<td>29</td>
</tr>
<tr>
<td>Jeremy Baguyos</td>
<td></td>
</tr>
<tr>
<td>Michael Meets Ableton Live</td>
<td>33</td>
</tr>
<tr>
<td>Adam Patrick Bell</td>
<td></td>
</tr>
<tr>
<td><strong>Making music with technology: a free improvisation ensemble</strong></td>
<td>37</td>
</tr>
<tr>
<td>Oded Ben-Tal</td>
<td></td>
</tr>
<tr>
<td>Robert Domianiuk</td>
<td></td>
</tr>
<tr>
<td>Sam Heath</td>
<td></td>
</tr>
<tr>
<td>Sam Kendall</td>
<td></td>
</tr>
<tr>
<td>Diana Salazar</td>
<td></td>
</tr>
<tr>
<td>An Imaginary Subject? Designing ‘Music &amp; Digital Media’ for a</td>
<td>41</td>
</tr>
<tr>
<td>Post-Conservatorium BMus Programme</td>
<td></td>
</tr>
<tr>
<td>Samantha Bennett</td>
<td></td>
</tr>
</tbody>
</table>
“The Traveler Sonnet”: The technology as a key element in the study of musical heritage through an inter-university and interdisciplinary educational experience

Noemy Berbel-Gómez
Alberto Cabedo-Mas
María Elena Riaño-Galán
Cristina Arría-Sanz
Maravillas Díaz-Gómez

A brittle discipline: Music Technology and Third Culture Thinking

Carola Boehm

Researching coding collaboratively in classrooms: Developing Sonic Pi

Pamela Burnard
Samuel Aaron
Alan F. Blackwell

Children’s compositional strategies in their interaction with digital tools: a micro-genetic analytical approach

Vasiliki Charisi

Influence of sequencing software in musician competences

Francisco José Cuadrado Méndez

Preparing the music technology toolbox: addressing the education-industry dilemma

Robert Davis
Steven Parher
Paul Thompson

The Art of Practice: the crossroads between reflection, creativity and determination

Monica Esslin-Peard
Tony Shorocks

Initial Teacher Education in England: Music Trainee Teachers’ Development of Technology Skills

Marina Gall
Nick Breeze

Collaborative music production in a virtual learning environment: An experience with English and Spanish students

Andrea Giraldez Hayes
David Carabias Galindo

An Exploratory Study of the Effect of an Eye Guide While Sight Playing at the Piano

Sara Hagen
Walter Boat
Vicki McArthur
Cynthia Stephens-Himonides
Alejandro Cremaschi

Technology-mediated feedback in advanced level piano learning of ABEGG Variations by Schumann: an exploratory pilot study

Luciana Hamond

Musical gameplay: a theoretical exploration

Sigrid Jordal Have
Lauri Väkevä

A constructivist model for opening minds to sound-based music

David Holland

‘The old in the new’: teaching and learning traditional music online

Ailbhe Kenny

Studio Pedagogy: Perspectives from Producers

Andrew King

Introducing technology in Cypriot primary classroom music lessons: “I learnt using things in music I didn’t know existed”

Chrysovalentini Konstantinou

The EARS 2 Pedagogical Project – an eLearning environment to introduce learners to sound-based music

Leigh Landy
Sarah Yuanie
Andrew Hill
Mazie Wolf

FourChords Guitar Karaoke Makes Learning Guitar Easy

Paula Lobo

Ecocompositional techniques in ubiquitous music practices in educational settings: Sonic sketching

Maria Helena de Lima
Efficient Computer-Aided Pitch Track and Note Estimation for Scientific Applications 143
Matthias Mauch
Chris Cannam
György Fazekas

Vygotsky, Eliot, and Linguistic Crossroads: Transposing Musical Beauty for the Language Classroom 147
Andrew Meyerhoff

How pianists listen to recordings of Schumann’s Träumerei?: Comparisons with self-evaluation and external-evaluation 151
Yuki Morijiri

"I can do it!": Using the iPad in musical performance with students with special needs 155
Clint Randles

Vocalmetrics: exploring multiple dimensions of singing in early popular music recordings 159
Felix Schönfeld
Tilo Hähnle

Processes of Learning in the Project Studio 163
Mark Slater

Picalab Musi-Matemáticas Sonoras Interactivas. Design, implementation and evaluation of a software package and didactic guides for mathematical education based on musical metaphors for primary education in Chile 167
Jesús Tejada
Tomás Thayer
Alicia Vargas
Randall Ledermann
Alberto Lecaros
Mirko Petrovich

Connecting learners, employers and practitioners through emergent digital technology 171
Mark Thorley

How could musicology help me become a better record producer?: tensions between the vocational and the theoretical in music pedagogy
Simon Zagorski-Thomas
Picalab Musi-Matemáticas Sonoras Interactivas. Design, implementation and evaluation of a software package and didactic guides for mathematical education based on musical metaphors for primary education in Chile

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ABSTRACT

The Picalab Project proposes the design, development, and study of an integrated mathematics-music software solution to leverage learning of mathematics in a classroom context, by use of music as metaphors for mathematical curricular contents. Software modules were developed, based on Brousseau’s Theory of Didactical Situations framework, and aimed at the 3rd, 4th and 5th grades of Chilean primary education level.
The modules can be used by students all by themselves, but the teacher is considered a primary and key player in the implementation of this solution. Primary proof of concept and usability tests seem to point to music, as representation of curricular mathematical contents acts as scaffolding of learning, anchors new information in the socio-cultural context of learning, can be part of situated knowledge, and offers a new perspective for learning mathematics at schools, giving pupils opportunities to develop their own mental representations.

**KEYWORDS**

mathematical learning, didactic software, music

**AIMS**

The objective of the Picalab project is to design MMSI (Musical Mathematical Sound Interactive) modules, consisting of a software application paired with a didactic guide, which would allow a school teacher to present mathematical concepts or concepts, leveraged on a musical or sound based experience. Great consideration was given to the fact that Math teachers do not necessarily have sufficient training in music, and could therefore be averted by the apprehension of having to address musical concepts they do not master during their lessons with the MMSI. To this end, a didactic guide was specifically written to show the teacher how to best take advantage of the interest that students naturally have in music and sound, to create a significant contextualization for otherwise abstract or difficult mathematical concepts.

**METHODS**

The production of MMSI consists of a three stage, iterative process: 1) Proposals for a non-functional prototype; 2) Selection and prototype implementation; and 3) Class evaluation and feedback.

**OUTCOMES**

Preliminary results show that students become highly motivated with this approach. Students show a very good attitude towards the modules, and remain in activities for the whole extent of the class. Most remarkable, is the fact that they can engage in active discussions about topics that, in a typical lecture format, they do not. They engage in formulating hypothesis regarding the “behavior” of different multiples, and then proceed to validate or reject them by means of the module itself. They consistently arrive at conclusions such as “a common multiple of two numbers is necessarily the product of these numbers”, and shortly discover that this is not necessarily the least common multiple. The fact that these abstract or non-contextualized math topics are now presented in a musical context is apparently a key factor. This is currently being tested for later publication.

**CONCLUSIONS**

revealed a very important motivation and positive attitude towards the use of each music-mathematic module presented, particularly in those with a more game-like form. The music component, most evident in the exploratory (no guided) first phase of use of each module, is attractive to practically all students, even those that do not consider themselves “music experts”. Equally important, this interest and motivation is also present towards the mathematical concepts involved. The fact that these are presented in a musical context seems to enhance interest and scaffold comprehension in them. These preliminary results seem to indicate that this interdisciplinary approach is worthy of further research, which we expect to broaden as we gather more and definitive data in the quantitative and qualitative final assessment.

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**REFERENCES**

