Antropoloops online music remix tool for education: A Web Audio API Case Study

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ABSTRACT

In this talk we will explain why and how we used modern web technologies, and specifically, the Web Audio API to build a creative digital tool intended to be used in the entry levels of our public educational system (primary and secondary education).

We are Rubén Alonso (artist and co-creator of "Antropoloops[1]" project: a creative approach to ethnomusicology, where musical expressions from different cultures and times come into dialogue through electronic music) and Daniel Gómez (musician and software developer). We are part of a team made up of artists, educators and technicians, that asked ourselves how to combine sound collage, body movement and electronics to celebrate and engage cultural diversity in educational environments.

Since 2017, with the support of various institutions as Carasso Foundation, European commission and Obra social La Caixa, we are developing both a methodology and an online remixing tool that aims to explore the potential of music remixing as a way to work towards cultural inclusion at schools.

1. Intercultural musical education and technology

Unlike other contexts such as the USA, Canada or the UK, in Spain, the debate on the need for intercultural music education is recent [1], and it is associated with the increase of the number of students of foreign origin, as a consequence of the growth of the immigrant population since the early 2000s.

Since the 70s efforts have been made to broadening the musical repertoire, incorporating cultural expressions from all over the world, following the certainty that a more plural learning process contributes to the development of a multicultural awareness in the students, mutual understanding and tolerance [2]. On the basis of these experiences, the Antropoloops workshops intend to explore a didactic perspective derived from the contemporary remix logic and the musical experimentation through digital technologies.

In order to achieve cultural inclusion, we try to incorporate individual student narratives in school life to facilitate the expression of diverse identity paths linked to communities of origin, rescued through their popular music. The use of remix allows us to foster and normalize the construction of a hybrid identity and the student's experience of dwelling in different cultural worlds.

We use musical remix as a place for play and encounter, a space where differences are seen as creative, dynamic and open as ongoing. We work with music as a vessel for life stories, emotions and intertwined cultural narratives [4]. This approach it's based on two core concepts that are highly dependent on the use of technology: sampling and remixing of musical sources linked to our family memories, and locating the music in maps ("maps" in a broad sense, as a term that includes any surface or interface with a cultural meaning, including our bodies for example).

Thinking out the potential of remix in school as a creative approach implies reflecting on the students' capabilities and competencies to work with it according to their age. But it also implies thinking about the teachers' capabilities to use these tools, and about how we can design activities and transfer/convey knowledge from the artistic field.

Working from the public school system and in neighbourhoods with low-income families, we have found two challenges incorporating new technologies into the classroom: First, the lack of specific tools that covers teachers (not students) needs and knowledge. Although most teachers are very well prepared in didactic terms, when new technologies come into play, the preparation is very diverse, to say the least. This, coupled with rather high class ratios, means that few people venture into using digital tools in the music classroom. On the other hand, except in places with very high incomes, in most of the public schools, computer resources are scarce and in many cases obsolete.

2. First tool: Antropoloops player (play.antropoloops.com)

The first tool we developed focused on providing an easy-to-use tool for teachers to use in the classroom. In addition to the online tool, and in collaboration with some teachers, we generated a series of sound projects and associated didactic guides to work on different student's competencies.

This tool helped us to test different ideas and technologies that we wanted to use. After some experimentation (mostly native applications both in desktop and mobile) we decided to create an accessible web app using Web Audio API for audio interactions.

The main goal of this tool was to enable students between 10-12 years old, to remix and compose with loops in front of an audience. For this purpose a physical way to interact with the application was a must.

In our experience, using custom hardware in the classroom has been one of the most challenging tasks. All hardware we have tested has shown its problems. We started with sophisticated technologies like tangible interfaces (were too expensive) and machine vision (performed poorly if there were not the right lighting conditions). Finally, very simple and cheap hardware interfaces (such as Makey Makey) allowed the students to express themselves in creative ways, and has proven to be the most effective technology to enable adoption without our external intervention (not without its own problems, for example, floor electric connectivity).

1 Watch a presentation talk about the artistic project here: https://www.youtube.com/watch?v=oatdM-jsVaI

3. Second tool: Antropoloops editor (app.antropoloops.com)[2]

The second phase of the project consisted of developing a tool for students to create their own sound projects. The main focus of this tool is to provide an easy-to-use interface for students between 12 and 15 years old. We want them to be able to record and edit their own sound fragments, and organize them in a meaningful way.

One of the technical requirements is that the tool will work on a wide variety of low end devices, such as those found in the schools we work with. Again, web technologies (and in particular, Web Audio API) have had surprisingly good results in this regard. We used MediaStream Recording API to record audio directly from their own devices.

Another goal was to make the tool work without an internet connection. To make the tool work offline we use several combined strategies: first we use Amazon Datastore[3] (allows to work offline and synchronize with the database when the connection is present) to store the data, and IndexDB to store files locally in the browser. We use our own code to synchronize those files with a remote object store.

Second, we perform audio processing on the client side instead of the server. We have used a web assembly version of the ffmpeg library for format conversion and audio cropping. Unfortunately, due to the size of the library, it does not work properly on devices with fewer resources. We are still looking for solutions to that problem and plan to use web assembly for other non-real time audio manipulation tasks such as time stretching or audio effects.

4. Our experience in the classroom: San Jose Obrero public school and beyond

We've been using these tools for three years in a high diversity (around 50% of them are of non-Spanish origin) public school in Seville. It has been years of experimentation and iteration where, fundamentally, we have made our methodology more specific and our tools simpler.

Activities, with music as a vehicle, have been developed using a project-based learning (PBL) approach collaborating with different teachers in the school. Our aim is that all the proposed activities can be carried out by any teacher without external help. Although this has not yet happened (there has always been someone from our team supporting us), we believe that we are close to it. Next year will be the first time the methodology and tools will be used without our intervention while we will focus on expanding the experience to other schools and social projects, and we will provide training courses for teachers interested in the project.

On the technical level we expect to increase the usage of web assembly to provide more sophisticated audio tools (like time stretching and other audio processes), expand the hardware connectivity, and improve expressiveness through audio effects. Our aim is that students can use the web tool to compose, play and as a tool for visualizing relations between the audio sources.

One of the most satisfactory experiences has been the collaboration of three European schools (Seville, Istanbul, Warsaw) in the collective composition of a musical piece[4], which opens new paths for developing collaborative workshops between schools in different countries through the web tool. We just started a collaboration with IAPH[5] to connect our tool with their sound archives, to help disseminate their materials to new young audiences, and bring new life to the archives through remixing. We want to do the same with other Cultural Institutions' sounds archives.

5. Conclusions

An universal web platform that is virtually accessible to everyone, has been fundamental to our goal of improving the adoption of a digital creative tool in the entry levels of our public education system. Technologies such as webassembly open up new horizons for the capabilities that will be possible in this type of tool.

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6. REFERENCES

[1] See for example Giráldez Hayes, Andrea, Graciela Pelegrín Sandoval, y Carmen López García. 1996. *Otros pueblos, otras culturas: música y juegos del mundo : primaria*. Madrid: Ministerio de Educación y Cultura. See also Giráldez, Andrea. 1997. «Educación musical desde una perspectiva multicultural: diversas aproximaciones». *TRANS. Revista Transcultural de Música*, 10.

[2] For an overview of approaches and initiatives in USA see Campbell, Patricia Shehan. 2018. *Music, education, and diversity: bridging cultures and communities*. Multicultural education series. New York, NY: Teachers College Press. See Volk, Terese M. 2004. *Music, Education, and Multiculturalism: Foundations and Principles*. Oxford University Press, USA, for Canada, UK and other countries

[3] The life story was a widely developed technique and method in social sciences throughout the 20th Century, and since the 1980s it has been applied in the educational sphere as a biographical method. A musical life story (MLS), in the way we have been exploring it up to now, is a short account in which a person tells us about their life experiences through a song that is important to them. From a formal point of view, it is a song story or a fragment of a song preceeded by an account that contextualizes its listening with the life experiences of a person. Tale and music feed into each other and enable us to experience a more intense or deeper listening. For a related background see Campbell, Patricia Shehan. *Songs in Their Heads: Music and Its Meaning in Children's Lives, Second Edition*. OUP USA, 2010.

2 Unlike play.antropoloops.com, the editor is not yet a public tool and credentials are needed to use it. We have created a specific instance to be used within the Web Audio Conference here: wac.antropoloops.com (email: wac@antropoloops.com, password: wac2021)

3 https://aws.amazon.com/es/blogs/aws/amplify-datastore-simplify-development-of-offline-apps-with-graphql/

4 Watch a video of the process here: https://vimeo.com/362366415

5 https://www.juntadeandalucia.es/organismos/culturaypatrimoniohistorico/iaph.html