Ultimaker Orchestra

An Education Challenge Proposal
and Pioneer Project

“Music is your own experience, your own thoughts, your wisdom.
If you don't live it, it won't come out of your horn.
They teach you there's a boundary line to music.
But, man, there's no boundary line to art.”

Charlie Parker

Ultimaker Orchestra /

Project Outline:

Create an Ultimaker Orchestra of 3D printed Instruments.

Construction of eight diferent musical instruments.

Two instruments for each of the main categories of the Hornbostel-Sachs musical instruments classification.

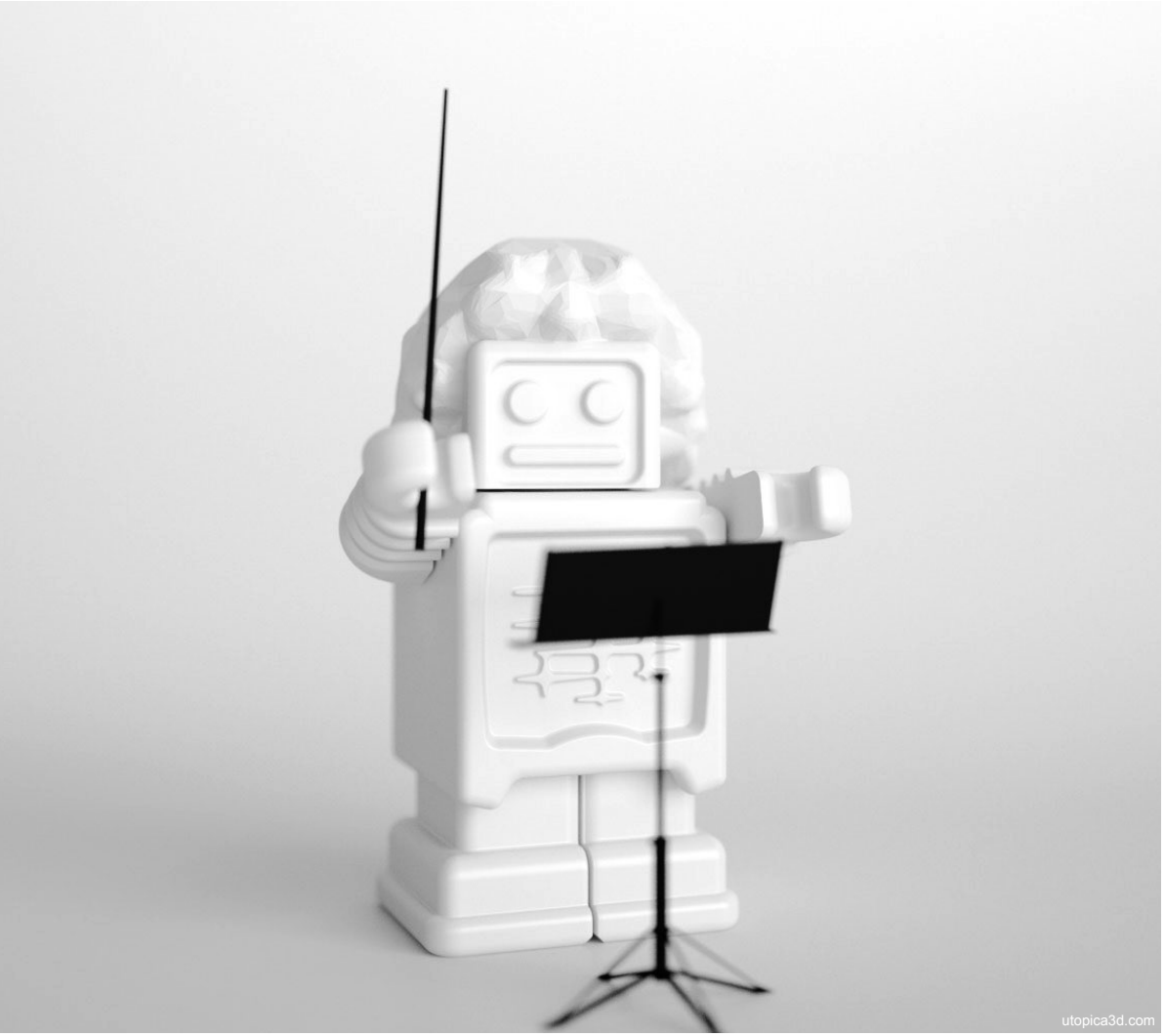
Chordophone is a musical instrument that produces sound by way of a vibrating string or strings stretched between two points.
e.g.: guitar / cavaquinho

Aerophone - a musical instrument that produces sound primarily by causing a body of air to vibrate, without the use of strings or membranes, and without the vibration of the instrument itself adding considerably to the sound.
e.g.: flute / ocarina

Membranophone any musical instrument which produces sound primarily by way of a vibrating stretched membrane.
e.g.: drums with different percussion modes

Idiophone any musical instrument that creates sound primarily by the instrument vibrating as a whole, without the use of strings or membranes.
e.g.: maracas / xylophone (metalofone)

Project description



1 Stage 1 - 3D Musical Instruments

Each student group will be assigned with one of the four main categories of the Hornbostel-Sachs musical instruments classification.

Each group, will be responsible for studying, exploring, creating and making, two musical instruments representative of their assigned category.

Each Student group will first work with an existing Musical Instrument 3D model, of their choosing, available for 3D Printing and licensed for educational use, that can be found in sites like youimagine.com

2 Stage 2 - Sound Experiments

In stage 2, students will continue learning and experimenting, but will have a new challenge, they will have to (re)create an “original” musical instrument that meets the classification criteria of their assigned category.

- Testing of the 3D printed prototypes based on;
- Their sonic qualities of timbre and sound profile.
- The quality of their Acoustic resonance
- Other aspects related to the final purpose of playing the 3D printed instruments.

Project description /

Cinco de Mayo Maracas
Published on Apr 01, 2016
By Ultimaker
http://www.youmagine.com/designs/cinco-de-mayo-maracas

3 Stage 3 - Instruments Fabrication and Post-Processing (3D printing + other elements)

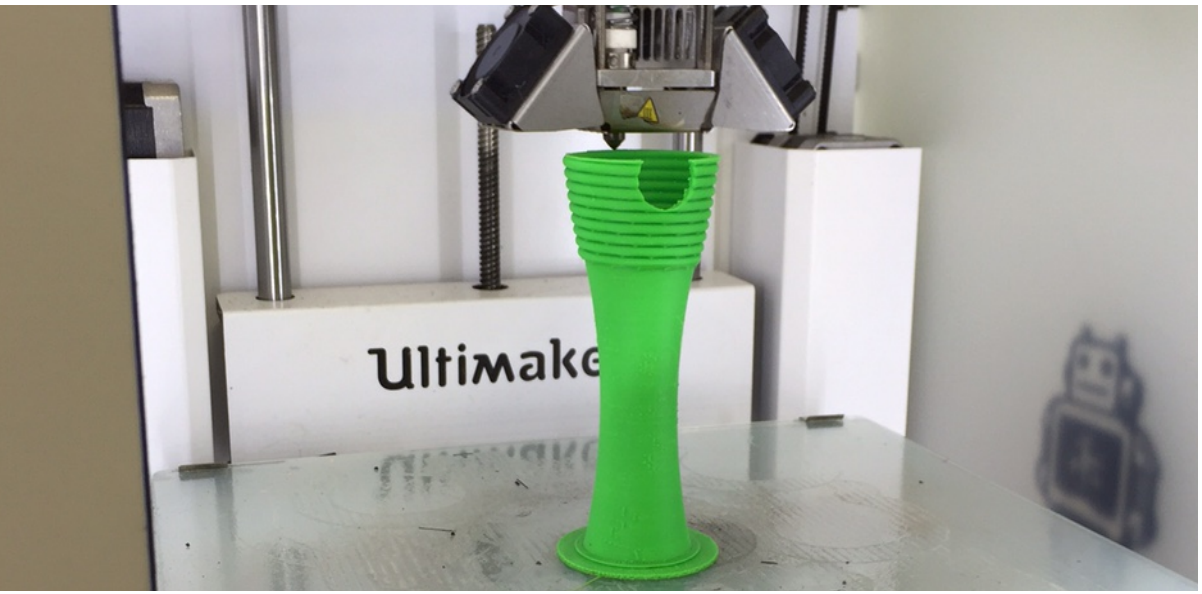
- 3D Printing 3 copies of each final instrument for a total of 24 instruments.
- Post Processing of the 3D printed instruments. Cleaning, joining and adding other elements if necessary to complete the instruments. (cords, membranes, etc…)

4 Stage 4 - Integration of the 3D printed instruments in four different musical situations.

- Creation of a classroom orchestra with Ultimaker 3D printed instruments only
- Ultimaker instruments integrated in the existing school's Orff Orchestra.
- Ultimaker instruments integrated in the Symphonic Orchestra of Sintra's schools group. With the participation of some composers who will create a new musical repertoire to include the Ultimaker 3D printed instruments.
- Ultimaker instruments integrated into the school's youth bands, as companions in the different musical genres that they practice.

Education Objectives

Mexican Güiro Percussion Instrument
Published on Sep 20, 2016
By Michael Bourque
http://www.youmagine.com/designs/8213



Student's Learning Goals (and Mine also)

- Explore the possibilities of 3D Printing applied to Music education and learning.
- Develop a project from concept to completion.
- The development of team-work and relationships skills outside student's personal environment/ethnic group.
- Motivate students to find, explore and understand the relationships between Music and daily life objects and/or with other curriculum subjects, like Mathematics, Physics, Geometry, etc.
- Learning to face challenges and to solve problems using creativity and ingenuity.
- Value the creation processes and the resulting objects as useful tools for music production.
- Sharing and combining knowledge and experiences with other teachers of different areas/subjects.

Previous Experiences /

Maria João Magno

Music, as a phenomenon, cannot be seen. One hears it, One feels it and One understands it. But by the force of its identity, I do not believe that we can get someone to understand Music with words and analogies. I prefer to approach Music, with Music. In my twenty years of Music teaching experience I've tried to use everything that was at hand, to help my students understand what I'm trying to communicate. It is in this sense that cabinets, tables, chairs, pencils, slates, chalk, plastic bottles, plastic toys and everything else that is available in the classroom or in the student's personal space, serves to produce musical excerpts with the purpose of explaining myself to the students. Fortunately there has been an understanding of what I'm telling them.

The interest in reusing "recyclables" came in 1989, when I first started teaching and I have been developing this aspect ever since. I then thought of something practical and it was through the construction of musical instruments made from everyday use/waste objects, some of them made with the most common material available today, plastic. Some of those objects were used in the School, and instead of just seeing them as trash I preferred to extend their life, by reusing them as musical instruments.

In 2009 I was able to form a classroom orchestra with only the student's common classroom materials. Among several objectives, students were required to be aware of the noise the different materials produced and how different it is to have disorganised sounds from having organised sounds. It was very interesting because each student had to transform an object of their classroom material into a musical instrument without making any changes to the object.

I remember one of the most interesting cases being one of a student's corrector fluid flask cap squeaking as he unscrewed it without removing it. The resulting sound surpassed in intensity and pitch all the other sounds. Another case was a sort of a washboard instrument, made out of a ball pen being moved up and down pressed against a notebook metallic spiral. Some of the students used plastic rulers and by taping them on the wood of the back of their chairs, produced sounds of several different pitches. Others blew on the ball pen plastic caps, or even into the plastic body of the ball pen producing sounds similar to whistles. Students were able to do things they were not normally allowed, or are forbidden to do in class. It was a true music festival with classroom supplies.

With another student group I asked the students to choose an object from their home or personal belongings: a big plastic flower pot, an aluminium pot lid, two little plastic bags, two candy containers, among many other commonplace objects. The two plastic bags (one for each hand), rubbed together, provided the base for the musical piece composition. The large flower pot, drummed on with the hands, brought the bass sound to the orchestra. The pot lid functioned as a drum cymbal and its sound lingered in the air and established the connection. The candy container filled up spaces in the tempo. The musical result was amazingly beautiful. Through experience, they also understood, that each individual instrument musical contribution is fundamental for the group's final musical success.

At that same school, I had two hundred and fifty-four students under my care, divided by eleven classes. I noticed that their motion patterns across the classroom and school grounds were chaotic and lacking discipline, even, to the point that some students would hurt themselves while going down the stairs. So I suggested a project entitled "Music and Security" with the goal of reducing the "foot traffic" problems in the school. I engaged all eleven classes in a system of musical interventions. All preparation for these interventions took place during regular classes, which after a while became a veritable rehearsal space as well as a stage for space movement manoeuvres experiences, comprising between twenty to twenty-nine students per class. All the learning experiences had as a starting point the musical practice and the relation between body and space both individually and in groups. This way Musical Theory made sense when presented, because all students had learned from their own experiences during rehearsals.

With the students from all the eleven classes, we were able to accomplish forty-four musical interventions during the school term. Some performances were better than others, but in general, the school got used to have live music, and we were, always, joyously welcomed at the different school's personnel work spaces. I know that those three or four minutes pauses, that school personnel made, did promote work productivity, profitability and efficiency, so I consider those few minutes not as wasted but gained.

Like in all teaching-learning processes, each individual decides what to do with the acquired knowledge, but in general most of the students by having practical learning experiences with Music, Spacial movement and Teamwork, both in the classroom and school environment, were able to establish connections between them. In short they became more conscious of their own roll within the group, improving their social and teamwork skills and consciousness, and as a result became more responsible.

And, I also learned that what I had set out to do, was, after all, possible.

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