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Making homemade musical instruments out of every-day recycled materials

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ABSTRACT
As educators, the question of how we could improve learning and what practises we would need to change as a teachers' association to alter the learning culture in school and perhaps make some subjects more enjoyable led us to conclude that sustained efforts and cooperation between teachers and students in an interdisciplinary learning framework, along with real-world experience of students, would be the optimal response. In this study, an effort was made to organise a scientific theoretical foundation for handcrafted musical instruments so that students from the Music School of Drama could create them, exhibit them in a classroom museum, and play them in an orchestra. Can glasses, utensils, and pails enter the Music School of Drama and create music? This is not some sort of spectacle! The response relates to the application of contemporary perspectives on the notion of "informal music" in formal settings and museum education.
Keywords: Music Education, Music Instruments, Experiential learning, museum education.

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Preamble

When the teacher -as an educational planner- uses multiple teaching aids and materials by applying the principles of inquiry-based learning and building on methodological tools that reconstitute the learning process as a significant path that is meaningful for students in a learning school, learning improvement becomes a viable option.

The development of lifelong learning skills can be supported by goal-oriented, comprehensive, open, and flexible emerging curricula that encourage students to become fully autonomous learners, acquire knowledge from a variety of sources, collaborate and develop interpersonal relationships, cultivate honesty, responsibility, and self-confidence, and be able to plan their personal and social futures (Doukas, 2013).

As tools for teachers, the new curricula offer up new fields of experience and assume a high level of professional education and growth. In Learning through Design, the educational objectives and skills of all teaching and learning disciplines and subjects of the new curriculum are essentially the principles of planning and organising instruction along the following dimensions:

Knowing and understanding, Exploring, Communicating, Connecting.

The school profile and vision for a learning school (Bagakis & Macbeath, 2008) place learning on the organisational culture agenda of a school that prioritises high-quality learning. In light of the aforementioned information, we endeavoured to create a context in which we would be able to compose the aforementioned aspects as teachers, giving students the opportunity to experience the development of homemade musical instruments in a school that is primarily focused on music, which was extremely beneficial in assisting students in selecting their specific project.

The purpose of this work has been to highlight educational and teaching practices, which help both school and teachers improve learning and lead to transformative learning through the use of multimodal semiotic systems. The students selected were the ones who freely expressed their desire to join the group, and make homemade musical instruments out of every-day recycled materials.

The group was organized consistently and the enthusiasm of the students did not take too long to show. By training on a specific time bound framework, the group managed to build the Museum of Handmade Musical Instruments of the Music School with great success. Planning was based on the schedule and goals of the Museum. A group of students from different school departments started working on establishing an exhibition of the School Museum.

The exhibition's objective was to: interdisciplinary perspective, students' hands-on approach through making musical instruments, encouraging student initiative, opening the school to the city's society as well as other schools in the prefecture, cultivating students' creative development, and cultivating scientific knowledge.

Our objective was to emphasize our school's practices designed to enhance learning.

At the level of education, our objectives were: For students to comprehend the need to develop and improve learning by focusing on expected learning outcomes, they must organize their thinking and creativity through a variety of activities that emphasize creative and critical thinking.

Method and frame for the build-up of exhibits

The Museum collection is based on research conducted by a music teacher, Dimitris Sarris, on handcrafted musical instruments during the 2009 Sports and Culture educational event "Mathitiada" In addition to the exhibition arrangement materials, any other materials deemed necessary for constructing the exhibits or developing the museum's open space were also purchased.

The Teachers' Association of the Music School is comprised of educators who reflect on organised educational experiences, focusing on educational change both through processes (educational methods, teaching approaches, learning sources and resources, development tools, assessment, and relationships) and learning outcomes, valuing the participation and educational experiences of students from diverse sociopolitical backgrounds.

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Implementation stages

The study stated that it would provide a comprehensive breakdown of the report's implementation process.

1st Group Meeting

In the first meeting, the teacher was introduced to the group's students and the project's topic was determined. During this assembly, the students were informed of the exhibition's theme and a sample of the instruments to be constructed was displayed. Then, the pupils classified the instruments according to the system developed by Hornbostel and Sachs, two prominent ethnomusicologists. With their teacher, the students discussed potential musical instruments for the exhibition as well as their own ideas. The first group meeting was a triumph, with students displaying enthusiasm for the exhibition theme and a strong desire to complete their projects.

2nd Group Meeting

In the second group meeting, the students were instructed on how to register for the Handmade Musical Instruments project's online class. The goal of the e-class was to introduce children to new technologies, provide ICT instruction, and bring the group together so that each student could collaborate with the others from home. The teacher then created a Google Drive account, to which all group members were invited, and they worked on an assignment related to the classification of musical instruments by Hornbostel and Sachs. Each group selected a category of instruments to analyse after being organised into groups of two or three members. The instrument categories include membranophones, idiophones, chordophones, and aerophones.

3rd Group Meeting

At the third group meeting, a CD-ROM on "Greek folk musical instruments" was presented to the students by the Friends of Music Society, under the scientific supervision of Lambros Liavas from the Music Library of Greece, 'Lilian Voudouri'. The CD-ROM was projected on a whiteboard with interactivity. The students had the opportunity to observe all of the instrument categories covered in previous courses. Each group received an analysis of each Greek folk musical instrument, accompanied

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by images and audio of the instrument. In addition to the presentation, the students engaged in a constructive dialogue by posing questions and providing input. Finally, the students comprehended how the groups would function and were able to search for various sources for their assignment.

4th Group Meeting

At our group's fourth meeting, we continued to present the "Greek folk musical instruments" CD-ROM. We completed all categories of instruments and travelled throughout Greece on a musical pilgrimage. We heard music from every region of Greece, Mikra Asia and Pontus. Many of the students already knew the tunes they listened to as a result of their traditional instrument instruction. In addition, we connected to the internet on the interactive whiteboard and logged into the e-class, where the entire class discussed any forum-related issues and concerns. The students had already enrolled for the online course and explored the digital environment. Finally, we viewed YouTube videos of handcrafted musical instruments.

5th Group Meeting

We spent the fifth meeting answering queries regarding the e-class, emails, and Google Drive project. The queries were posed in real time on an internet-connected interactive whiteboard. They discussed issues pertaining to the classification of acoustic instruments, and we responded to questions regarding the E-class, in which everyone participates.

6th Group Meeting

At our sixth meeting, a physics instructor from a music school led the lesson. The lecture was conducted under optimal conditions for comprehension (see experiments). It examined concepts and experiments in physical acoustics and sound transmission. Initially, the instructor referred to the sound waves that transmit sound from our bodies to our hearing. In order to help children, comprehend the theory of sound transmission, he simultaneously demonstrated how sound is transmitted from a toubeleki (traditional drum) to our hearing and the mechanical oscillations (vibrations) that are produced. He then discussed decibels (dB) and performed an experiment using a decibel sound level metre.

Consequently, we measured the decibels the device emitted when we were speaking in class. They conducted a similar experiment with a Hz metre in order to comprehend the meaning of Hertz. In addition, an audiogram was performed in which the children indicated when they heard the sound and when they no longer heard it. The frequency at which minors lost their hearing was approximately 19,000 Hz, while teachers lost their hearing much earlier. At this juncture, we discussed ultrasonic and infrared technologies.

7th Group Meeting

Physical Acoustics Continuation

A subsequent lesson on physical acoustics concerned harmonics created in a water-filled crystal goblet, where we dipped our finger and then rubbed it along the rim. All students participated in this experiment, and we heard the frequency generated by the musical note A (or La). Next, we recorded students' and instructors' voices. Then, we listened to the voices, which appeared to be very distinct. The recording was made at number 100 via a specialised virtual recorder program. We changed the number in the program to 110 and listened to the recording again; our voices sounded significantly "older" this time. Again, when we changed the number to 90, our voices sounded quite thin, almost childlike. The children found the experiments to be quite fascinating, as they were able to actively participate and grasp through a hands-on activity the concepts of physical acoustics and sound transmission. The students posed their questions to the physics instructor and inquired about the programs that introduced the concepts of physical acoustics.

8th Group Meeting

During the eighth meeting, it seemed appropriate that we should run a thought shower - a Brainstorm and some scamper questions. The idea was born due to the nature of the project, as well as out of the need to theoretically cover all the students in the group, taking into account the learning difficulties of students within the group. First, a member of the group wrote the word Musical Instruments on the board, then asked the other members to participate by putting the instruments into

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categories according to the system of musical instrument classification devised by the ethnomusicologists Hornbostel and Sachs. In the second part, some questions had been prepared in order to make the group visualize alternative instruments, and think about methods to make them, using images from various every-day objects. Hence, the students came up with some photos of materials such as drying racks, glass jars, bottles, glasses, legumes, spoons, clay pottery, posters, etc. and each time they had to think and say what we could make out of them. Some of these questions were:

- *What would I achieve if I combined different materials from the suggested ones?*
- *What would happen if I covered the object or if I modified one of its features?*
- *What would happen if I removed a part of the object or its material?*
- *What would happen if I made it too big or too small?*
- *What would happen if I made it backwards or if I changed its use?*
- *How could we adapt the object to a musical instrument in an alternative way?*
- *How could we use the object, or how else could we make it so as to serve our purpose?*
- *What other material or object could we use to replace the objects you see?*

In the current lesson, all of the students participated actively, were extremely enthusiastic and were very inventive; through their creative thinking, they came up with a variety of solutions and answers to the above questions, and they had a fantastic time doing so. Using the presented questions and images as a starting point, the entire group combined, modified and changed, eliminated, shrunk, reversed, and altered the shape, adjusted, changed use, and enhanced images, objects, their use, as well as their imaginary essence and significance.

9th Group Meeting

At the ninth meeting of the group that crafts handcrafted musical instruments, we began crafting miniature educational instruments. We gathered transparent glassware and made maracas out of various legumes, including beans, lentils, fava beans, lima beans, chickpeas, and rice. First, a member of the group distributed the containers and filled each with a unique legume. Each glass was half-filled with legumes, and then a similar glass was attached on top using a silicone gun. Then, after placing the maracas aside to dry, we attempted to incorporate rhythmology into the handcrafted pedagogical instruments we had just created. The students initiated a cadence, which the rest of the group followed. The first time the group made instruments was a lot of joy. Through creativity, the students took on responsibilities, became active, and crafted handmade maracas that were immediately used in rhythms.

10th Group Meeting

At the tenth meeting of the group engaged in the creation of handcrafted musical instruments, boxes of milk and rice portions were used to create idiophones, or maracas. We pierced an empty box with a wooden skewer stick and filled it with rice. Then, we adhered a second empty box to the top with silicone sealant, inserted the skewer stick, and attached coloured rubber bands. We created two components for a pair of maracas. In addition, we constructed numerous chordophones from empty Styrofoam boxes. In an empty Styrofoam box, we placed rubber bands that were sufficiently stretched and loosened to generate various "sounds" through oscillations. The participating students rose to the occasion and created an instrument for each participant using their own materials.

11th Group Meeting

During the eleventh meeting of the group tasked with handcrafting musical instruments for 2014–2015 project, a number of instruments and auxiliary components were created. Initially, the students constructed chordophones from Styrofoam bowls and assorted coloured elastic bands that were distributed to each student. In an attempt to tune to an octave, eight rubber bands were positioned side-by-side in the device.

Considering that some of the students were able to tone the rubber bands, the students' aesthetic and musical responses to the completion of the chordophone were quite positive. The Styrofoam implement served as a resonator, allowing us to achieve the desired outcome.

Next, the students were given ten skewer rods. They trimmed the margins with scissors so that they were not sharp and assembled them in two sets of five. Each student received four rubber bands that were attached to both extremities of each set. Consequently, we crafted a pair of drumsticks for each student. Tassos Lazaridis, utilising the construction table, played a rhythmic pattern in 4/4 meter and invited his classmates to perform the same rhythm in the final five minutes, after all students had constructed the instruments described above. The children quickly caught on to the same rhythmic pattern, and as a result, Tassos was able to quickly progress to cadence variations. The amazing outcome was captured on video for the purposes of the endeavor.

12th Group Meeting

The students created a "rain stick" during the group's twelfth meeting devoted to the creation of handcrafted acoustic instruments. Empty cartons of Pringles crisps, pins, rice, and glue were used as materials. The students were required to place numerous pins in various locations on the interior surface of these empty cases, which was time-consuming and thus took too long. We inserted hundreds of pins into a large cardboard tube, producing a sound reminiscent of rain descending. The pins were positioned with care and in various locations inside the boxes and the cardboard tube in order to induce resistance in the rice that would be placed inside. When placing the pushpins in the receptacles, the students displayed a great deal of patience and concentration.

13th Group Meeting

At the thirteenth group meeting, we continued to make "rain sticks" by hand. After arranging the pins, we filled the receptacles with rice and sealed them with silicone sealant. Our "rain stick" instrument and the cardboard tube for our exhibition were completed; the students were ecstatic.

14th Group Meeting

At the fourteenth group meeting, students made their first attempt at demonstrating rhythmic patterns. Students were instructed to follow particular rhythmic motifs while assuming assigned roles. The reading rates followed a 4/4 metre. First, we played four measures in 4/4 metre, and then we maintained the same rhythm at a very low volume so that each student could improvise in the following four measures. For the last four metres of the musical phrase, we listened to the rain stick. The task required focus, obedience, and perseverance. Following a specific rhythmic pattern was initially difficult for the students, but they ultimately completed the activity successfully.

15th Group Meeting

In this meeting, six baking pans of varying sizes were used to fashion three sizes of handcrafted gongs. When viewed from both the front and the rear, each pair of identical-sized pans was tied together using tie-ups so as to resemble a gong. To create a large musical instrument that resembled a gong, we attached our gongs to aluminum broom handles and suspended them from a sturdy stand. Students experimented with striking the pans to generate both high-pitched and low-pitched noises.

16th Group Meeting

During this meeting, we organised a space for displaying the museum's materials. Using space in the lobby of the municipal administration building (Dioikitirio), we carefully placed all of our exhibits on large benches wrapped in recyclable brown paper. After conducting investigation for our theory classes, we produced images and commentary regarding musical instruments. Each display was accompanied by a caption containing the name of the display, its country of origin, and a photograph of an instrumentalist. When applicable, the captions were supplemented with concise information regarding the materials' utility. All of this information was intended to quickly inform the visitors (mostly children) and encourage them to create their own versions of the exhibits. Using handcrafted musical instruments from the exhibition, the students simultaneously performed a foreign song that was uploaded to the school's YouTube channel[1].

[1] *https://www.youtube.com/watch?v=OYUCMsQfFE8*

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Conclusion

These factors are both liberating and "restrictive" for our creations. When dealing with sound construction, it is inevitable to recognise that sound quality will not only lead to but also impose certain decisions. On the one hand, the construction will gain an additional practical dimension (audio), and the available communication protocols will be expanded. Due to the need to preserve and improve the sound quality of the material, however, certain alternatives regarding the selection, design, layout, and appearance of the material will be restricted.

Sturdy constructions to hold the tension of the strings; specific widths and masses to produce frequencies that fall within the range of human hearing; simplicity in composition so that sound does not vanish in connections and discontinuities; an emphasis on symmetry, good proportion, and a gradual climax when composing a musical scale; etc. It was essentially impossible to complete this programme in the allotted time, so it was a unique convergence of multiple possibilities and perspectives. The entire endeavor is an experiment, an ongoing exercise, of which this study is a part.

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Αυτοσχέδιες Μουσικές Κατασκευές από καθημερινά ανακυκλωμένα υλικά

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ΠΕΡΙΛΗΨΗ

Ως εκπαιδευτικοί, το ερώτημα πώς θα μπορούσαμε να θέσουμε για να βελτιώσουμε τη μάθηση αφορά στις πρακτικές που χρειαζόμαστε ώστε να αλλάξουμε -ως σύλλογος διδασκόντων- τη μαθησιακή κουλτούρα στο σχολείο, μετασχηματίζοντας με ευχάριστο και δημιουργικό τρόπο διδακτικά αντικείμενα. Η εμπειρική έρευνα μας οδήγησε στο συμπέρασμα ότι η καλύτερη απάντηση αφορά στις συνεχείς προσπάθειες και στη συνεργασία μεταξύ των εκπαιδευτικών και των μαθητών αξιοποιώντας -σε ένα διεπιστημονικό πλαίσιο μάθησης- την καθημερινή εμπειρία των μαθητών στην πράξη. Σε αυτή τη μελέτη, έγινε προσπάθεια να οργανωθεί σε επιστημονική θεωρητική βάση η κατασκευή αυτοσχέδιων μουσικών οργάνων από μαθητές του Μουσικού Σχολείου Δράμας ώστε να τα εκθέσουν σε ένα αυτοσχέδιο «μουσείο» εντός της τάξης αλλά και να τα παίξουν στο πλαίσιο μιας αυτοσχέδιας ορχήστρας. Μπορούν ποτήρια, σκεύη και κάδοι να ενσωματωθούν στην εκπαιδευτική διαδικασία και να δημιουργήσουν μουσική; Η απόπειρα αυτή δεν αφορά κάποιου είδους θέαμα. Η απάντηση σχετίζεται με την εφαρμογή σύγχρονων προοπτικών για την ερμηνεία της «άτυπης μουσικής» σε τυπικούς χώρους εκπαίδευσης για τη μουσική και μουσειακή εκπαίδευση.

Λέξεις κλειδιά: Μουσική Εκπαίδευση, Μουσικά Όργανα, Εμπειρική Μάθηση, Μουσειακή Εκπαίδευση.