



Article info:  
Received: 18 June 2023  
Reviewed: 2 August 2023  
Accepted: 25 October 2023

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## Innovation in Environmentally Friendly Materials: Making Paralon Soprano Alto Tenor Bass (SATB) Musical Instruments

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**Abstract:** This study seeks to explore the paralon's ability to make musical instruments. Paralon is a material that is strong against weather changes. The novelty of this research is in the form of the soprano, alto, tenor, and bass (SATB) paralon musical instrument. For this reason, researchers describe and explore the tool step by step until its presentation. The purpose of this study was to find innovations in making musical instruments from paralon. This study uses a qualitative method along with exploration. Data were collected through observation, interviews, and literature studies as reference materials related to this research. Observations were carried out by researchers by observing the making of the SATB paralon musical instrument, measuring the parts of the paralon, and taking notes. Exploration of the internet for literature to add insight about the object to be studied. The stages of making the SATB paralon musical instrument begin with finding the raw materials to be used. After all the raw materials are obtained, the paralon pipe is cut and shaped according to the design that the researcher made. Followed by installing a knife at the end of the paralon. After gluing, the process of finding the tone (tuning) of the paralon pipe begins. The table is needed to place the SATB paralon musical instrument, which is made and shaped according to the SATB paralon musical instrument.

**Keywords:** paralon, music instrument, SATB

### 1. INTRODUCTION

Indonesia is known for its cultural diversity, such as traditional houses, music, and traditional and modern musical instruments. Basically, a musical instrument is anything that can produce sound and is controlled and regulated by the players. Meanwhile, music is a combination or collection of frequencies that can be heard (Phetorant, 2020). Musical instruments are played by plucking, pressing, swiping, hitting, and so on. Currently, there are various types of musical instruments. Such as guitar, saluang, gamelan, and musical instruments from the results of innovation and exploration. One way is to explore using paralon material, namely pipes made of plastic. Paralon material is polyvinyl chloride (PVC) plastic.

The general use of paralon is to drain water, as is usually the function of a pipe. Apart from that, paralon can be a work or product with high selling value. The works that can be produced are bracelets, lanterns, ethnic lamps, and musical instruments. Getting paralon is very easy. Paralon material is widely sold in building materials or material stores. When listened to, the sound of paralon is very unique. The sound has different characteristics from instruments made from wood or other metal materials.

The shapes and sizes of paralon vary; there are large, small, high, low, or short lengths. Paralon pipes with various different shapes and sizes produce a distinctive timbre. A musical instrument made from paralon is a musical instrument without notes. So creative innovation is needed so that the paralon musical

instrument can be played in a musical composition. Creativity is measured by a number of indicators, such as originality, flexibility, ideas, imagination, and elaboration (Zhou, 2018). This includes making paralons with soprano, alto, tenor, and bass (SATB) tones. SATB is a regional division or tone ambitus for women and men. On SATB paralon musical instruments, the ambitus range of the notes is one octave more (less than two octaves). The construction of paralon musical instruments is designed, arranged, and arranged according to the size and height of the paralon. Paralon is also made from materials that can be recycled and are environmentally friendly. The novelty of this research is making a SATB paralon musical instrument. From the data that researchers have investigated, musical instruments have been found made from paralon, but they are not SATB. As Supriyono did, he made flutes made from paralon with large or small diameters with the additional commodification of children's rubber toy balloons (Albab, 2016). Paralon has the acoustic character of a loud sound when beaten, even without using a loudspeaker (Santoso, Kiswanto, and Setiawan, 2022). Apart from that, current climate changes from heat, rain, and humidity have no effect on the durability of musical instruments made from paralon.

This is different from musical instruments made from wood or iron, which need special treatment due to temperature differences. The problem in the research is to explore making musical instrument systems made from paralon in various shapes and sizes. Apart from that, its implementation is faced with the prolonged COVID-19 situation. Change is inevitable. Many new musical instruments were discovered or developments of existing ones. The idea of the SATB paralon musical instrument is to tell about the busy routine of craftsmen at work with various kinds of activities in their daily lives. Some are sawing wood or cutting pipe; others are nailing nails, making tables, or using other tools. Conceptually, this is a musical instrument without a basic tone. Researchers carried out creative innovations to create a musical instrument system made from paralon, which was divided into SATB. The SATB paralon musical instrument is a type of aerophone musical instrument. The sound is produced by an object being hit, which then makes a sound. The hitting tool is made from rubber because it is easy to shape and elastic.

The problem is limited to SATB paralon musical instruments. The specific aim of this research is to find a conceptualization of innovation in making SATB paralon musical instruments. First, it starts with the preparation and research setting stage; second, data and information collection techniques; and third, data and material processing techniques, which are continued with the implementation of making SATB paralon musical instruments. The focus of this research is the exploration of the SATB paralon musical instrument, which has a basic concept that is environmentally friendly and has innovation and novelty. Based on the background above, researchers are interested in researching the SATB paralon musical instrument.

## 2. METHODS

The method used in this research is qualitative and exploratory. Qualitative research is research in which a researcher obtains data from a natural background (natural setting) holistically in order to determine, describe, and test the truth of knowledge through scientific methods that are described in words, sentences,

or images that exist or are spoken by people or the behavior of people who are the object of research (Sugiyono, 2017). Paralon was explored in depth regarding manufacturing methods and organology. To answer problems regarding organology, researchers used the three stages carried out by Hawkins (1988), namely exploration, improvisation, and formation. Researchers also use library studies in the form of books, the internet, photo documentation, and audiovisuals. Photo documentation is used to explain the function, size, shape, and materials used in making SATB paralon musical instruments. Audio recording was also carried out on the SATB paralon sound to measure its frequency vibrations using the Sound Analyzer Free application. Observations were carried out by looking at and observing how the SATB paralon musical instrument was made, measuring the parts of the paralon, and recording all activities during the research. The aim is to complete the missing data. Exploration is a basic step in the process of making SATB paralon musical instruments. Exploration is carried out by looking for novelties about sound, color, and tone. This process generally takes quite a while because it seeks harmony between the musical sound and the predetermined concept. It is hoped that the results of this search will produce material for further development.

### 3. RESULTS AND DISCUSSION

#### 3.1 Quotations

Gaol (2016) focuses on how to make sulim (a flute) using paralon. The manufacturing process begins with cutting a long line in the middle of the paralon pipe, making blow points, tone points, drilling blow points, vibration points, sanding, and painting. Sulim paralon provides a new color and its own dynamics in the diversity of musical instruments in Indonesia.

Siregar (2012) discusses Taganing musical instruments, or instruments made from paralon pipes. Making Taganing musical instruments from paralon pipes does not take too long. The manufacturing stages start with selecting the paralon pipe, measuring, cutting the pipe, drying, scraping, forming, and assembling the taganing. The equipment used is a saw, pliers, screwdriver, measuring meter, hammer, and drill.

Setiawan (2019) discusses the organology or parts of the ketipung paralon instrument. The choice of material used is paralon, which is strong and not brittle. The "tak" part of the paralon produces a high sound, the bass part produces a low sound, and the "tung" part produces a middle sound. The longer and wider the diameter of the paralon, the lower the sound frequency produced; the shorter and smaller the diameter of the paralon, the higher the frequency produced.

Munna (2018) tackles a new form of music. The idea comes from the activities of carpenters when carving. The instrument used in this work is paralon. The reason for using paralon as an instrument is the result of an interpretation of the function of the tatah to make holes (holes in wood). Exploration of musical instruments is carried out by making a large number of holes in the paralon rod. The hollow paralon rod is played by opening and closing with the palms of the hands and soles of the feet. The game of opening and closing the hole aims to differentiate the color of the sound. Meanwhile, Prayitno's work (2016), entitled Nggrejih, started with an incident of rain that did not stop, which was then used as the basic idea for

making music. One of the musical instruments used in this work is a trumpet made from specially designed paralon. The trumpet is blown with a variety of continuous blows and unbroken blows. The aim is to give a different impression when the paralon trumpet is sounded.



**Figure 1.** SATB Paralon Musical Instrument  
(Source by the author, 2023)

### 3.2 Pipe

Pipe types are classified according to their function, location, and material. According to their function, pipes are divided into clean water pipes, used water pipes, dirty water pipes, and rain water pipes. According to their location, pipelines are divided into vertical pipes and horizontal pipes. According to the material, GIP pipes or galvanized iron pipes are used for cold, clean water installations only and are not recommended for hot water pipes. PVC pipe is a plastic pipe made from a combination of vinyl materials, which produces a pipe that is light and strong. High-density polyethylene (HDPE) pipes are pipes made from high-density polyethylene so that the type of pipe produced can withstand higher compressive forces. Steel pipes are used as pipelines for energy supplies, for example, water, gas, oil, and other flammable liquids. Steel pipes are generally available in cylindrical shapes but are also available in square, rectangular, and triangular shapes.

PVC has long-lasting properties and is not easily damaged. Paralon PVC also does not rust or rot. Therefore, PVC is most often used in irrigation/water systems and cable protection. In Indonesia, the standard size used for household and other water systems is the Japanese Industrial Standard (JIS), while for Regional Drinking Water Companies (PDAM) they usually use the Indonesian National Standard (SNI).

### 3.3 Making Paralon SATB Musical Instruments

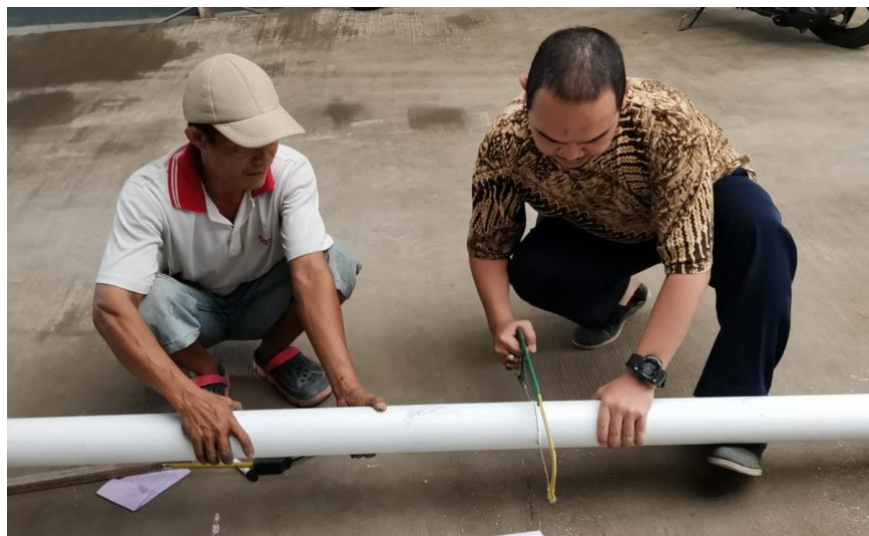
The process of making SATB paralon musical instruments starts with looking for raw materials or materials to be used, such as paralon pipes, knie, bolts, nails, glue, saws, measuring tape, sandpaper, and pencils.





**Figure 2.** Purchase of raw materials  
(Source by the author, 2023)

The type of pipe used is PVC. After the materials are collected, the paralon is measured, cut, and installed. Connecting paralon and knie using special glue. This special glue has high adhesive power, dries quickly, and is resistant to water, chemicals, and heat. In addition, it can withstand pressures above 400 psi. So, if the pipe is hit or rung, it won't come off. The paralon and knie are immediately connected and applied while the glue is still wet, on the inside of the knie and the outside of the paralon.



**Figure 3.** Measuring, Cutting, and Gluing  
(Source by the author, 2023)

Finding tones for paralon instruments is very difficult because there is no standard tool for finding tones for paralon instruments. The tone search is done manually by measuring the length and size of the paralon pipe according to the tone to be searched for using an online tuner. If the notes are not right, then the paralon is cut and then checked with a tuner until you get the right note. Of course, the resulting tone is not as precise as a piano instrument. The influence of the brand and thickness of the paralon also influences the sound or tone of the paralon, because each brand of paralon

has different thickness and flexibility. The paralon that has been measured produces a different sound from the striking tool. Like hitting using cardboard, plywood, or rubber. After several tries, we finally decided to use a rubber hammer. Rubber is flexible and not hard. Rubber is also easy to shape to the size we need. The shape is made like a table tennis racket. Use a coaster or pencil to make a pattern; once it is drawn, cut it using a knife. The technique for hitting the paralon is to hit it right in the hole. If not, the resulting sound or tone will be different. Players who will play the SATB paralon musical instrument are recommended to have the ability to play musical instruments such as the marimba or xylophone. To make it easier to play SATB paralon musical instruments.



**Figure 4.** Tuning  
(Source by the author, 2023)

The longer and wider the diameter of the paralon, the lower the sound frequency produced; the shorter and smaller the diameter of the paralon, the higher the frequency produced. SATB paralon tones can be seen in the following [table 1](#):

**Table 1.** Paralon Sopran

Tone	Paralon Size	Paralon Thickness	Knie Thickness	Knie Length
C	2,5 inch	1 inch	2 inch	21 cm
C#	2,5 inch	1 inch	2 inch	21 cm
D	2,5 inch	1 inch	2 inch	21 cm
D#	2,5 inch	1 inch	2 inch	21 cm
E	2,5 inch	1 inch	2 inch	21 cm
F	2,5 inch	1 inch	2 inch	21 cm
F#	2 inch	1 inch	3 inch	18 cm
G	2 inch	1 inch	3 inch	18 cm
G#	2 inch	1 inch	3 inch	18 cm
A	2 inch	1 inch	3 inch	18 cm
A#	2 inch	1 inch	3 inch	18 cm
B	2 inch	1 inch	3 inch	18 cm
C	2 inch	1 inch	3 inch	18 cm
C#	2 inch	1 inch	3 inch	18 cm
D	2 inch	1 inch	3 inch	18 cm
D#	2 inch	1 inch	3 inch	18 cm
E	2 inch	1 inch	3 inch	18 cm

The paralon soprano musical instrument consists of seventeen tube-shaped or cylindrical strings. A tube or cylinder is a spatial

structure formed by the length and shortness of a soprano tube. Each circle has different sound and tone characteristics.

**Table 2.** Paralon Alto

Tone	Paralon Size	Paralon Thickness	Knie Thickness	Knie Length
A	3 inch	2 inch	2 inch	24 cm
A#	3 inch	2 inch	2 inch	24 cm
B	3 inch	2 inch	2 inch	24 cm
C	3 inch	2 inch	2 inch	24 cm
C#	3 inch	2 inch	2 inch	24 cm
D	3 inch	2 inch	2 inch	24 cm
D#	3 inch	2 inch	2 inch	24 cm
E	3 inch	2 inch	2 inch	24 cm
F	3 inch	2 inch	2 inch	24 cm
F#	3 inch	2 inch	2 inch	24 cm
G	3 inch	2 inch	2 inch	24 cm
G#	3 inch	2 inch	2 inch	24 cm
A	3 inch	2 inch	2 inch	24 cm
A#	3 inch	2 inch	2 inch	24 cm
B	3 inch	2 inch	2 inch	24 cm
D#	2 inch	1 inch	2 inch	18 cm
E	2 inch	1 inch	3 inch	18 cm

The paralon soprano musical instrument consists of seventeen tube-shaped or cylindrical strings. A tube or cylinder is a spatial structure formed by the length and shortness of a soprano tube. Each circle has different sound and tone characteristics.

**Table 3.** Paralon Tenor

Tone	Paralon Size	Paralon Thickness	Knie Thickness	Knie Length
C	3 inch	2 inch	3 inch	17 cm
C#	3 inch	2 inch	3 inch	17 cm
D	3 inch	2 inch	3 inch	17 cm
D#	3 inch	2 inch	3 inch	17 cm
E	3 inch	2 inch	3 inch	17 cm
F	3 inch	2 inch	3 inch	17 cm
F#	3 inch	2 inch	3 inch	17 cm
G	3 inch	2 inch	3 inch	17 cm
G#	3 inch	2 inch	3 inch	17 cm
A	3 inch	2 inch	3 inch	17 cm
A#	3 inch	2 inch	3 inch	17 cm
B	3 inch	2 inch	3 inch	17 cm
C	3 inch	2 inch	3 inch	17 cm
C#	3 inch	2 inch	3 inch	17 cm
D	3 inch	2 inch	3 inch	17 cm
D#	3 inch	2 inch	3 inch	17 cm

The paralon tenor musical instrument consists of sixteen tube-shaped or cylindrical strings. A tube or cylinder is a spatial structure formed by the length and shortness of the tenor tube. Each circle has different sound and tone characteristics.

**Table 4.** Paralon Bass

Tone	Paralon Size	Paralon Thickness	Knie Thickness	Knie Length
A	3 inch	2 inch	2 inch	24 cm
A#	3 inch	2 inch	2 inch	24 cm
B	3 inch	2 inch	2 inch	24 cm
C	3 inch	2 inch	2 inch	24 cm
C#	3 inch	2 inch	2 inch	24 cm
D	3 inch	2 inch	2 inch	24 cm
D#	3 inch	2 inch	2 inch	24 cm
E	3 inch	2 inch	2 inch	24 cm
F	3 inch	2 inch	2 inch	24 cm
F#	3 inch	2 inch	2 inch	24 cm

G	3 inch	2 inch	2 inch	24 cm
G#	3 inch	2 inch	2 inch	24 cm
A	3 inch	2 inch	2 inch	24 cm
A#	3 inch	2 inch	2 inch	24 cm
B	3 inch	2 inch	2 inch	24 cm
D#	2 inch	1 inch	3 inch	18 cm
E	2 inch	1 inch	3 inch	18 cm

The paralon bass musical instrument consists of seventeen series of tubes or cylinders. A tube or cylinder is a spatial structure formed by the length and shortness of a bass tube. Each circle has different sound and tone characteristics.

A table is made to place instruments made of paralon. Made using wood, which is shaped according to the size of the paralon. The parts of the table are table legs, table base, and side and middle support posts. Wood is measured for the length, height of the front and back table legs, and width of the top and bottom. Each leg is given a gap for the wood to support the side of the table. Assemble everything into one that is reinforced using nails and bolts.



**Figure 5.** Table making  
(Source by the author, 2023)

After the table is finished, the next step is to arrange the paralon on the table. Starting from the largest size and the longest to the smallest, The SATB paralon series is arranged into one complete part that complements the other parts. Each part has an equally important role and function that cannot be separated. The choice of material, size, and shape has a definite purpose and direction, namely to produce sound characteristics and comfort in playing. As well as the main factor on the economic side in using materials that are environmentally friendly and easily available without reducing sound quality.





**Figure 6.** Paralon installation  
(Source by the author, 2023)

### **3.4 Timbre of the SATB Paralon Musical Instrument**

When observed and heard by the ear, the sound of the SATB paralon musical instrument has a unique sound color. In physics, the vibration frequency occurs in one second. Vibrations on SATB paralon musical instruments can be different. On a paralon soprano musical instrument, when struck, it produces a high-frequency "thung" sound with a pitch range of C-E1. The paralon alto musical instrument, when struck, will produce a middle-frequency sounding "thung" between soprano and tenor with a pitch range of A-E1. The paralon tenor musical instrument, when struck, will produce a middle-frequency sounding "thung" between tenor and bass with a pitch range of C-D#1. The paralon bass musical instrument, when hit, will produce a low-frequency "thung" sound with a tone range of A-E1. As for the sustain, in contrast to the Konde shamisen string, which is made from a 6-inch paralon (Setyawan, 2019), the sustain of the SATB paralon musical instrument is short. Each sound of the SATB paralon instrument has an interrelated function and role to form a beautiful sound. The distinctive timbre of the SATB paralon musical instrument can be heard and seen via the following link:  
<https://www.youtube.com/watch?v=cdxIKDg6U-g>  
<https://www.youtube.com/watch?v=naNhOUQ2ZNY>.

### **3.5 Player Position**

There are positions, attitudes, or procedures for playing the SATB paralon musical instrument. The position when playing a musical instrument affects the visual beauty and comfort of the player. The SATB paralon musical instrument is played in a standing position with a slight bend. For some people, because of the difference in height, there is no need to bend over. Everything is returned according to the player's needs and comfort.

SATB paralon musical instruments have limitations in their pitch range. Not all repertoire can be played on SATB paralon musical instruments. Tone registers are only made in one octave. This can be adjusted by arranging or creating a composition.

## **CONCLUSION**

The SATB paralon musical instrument is a form of innovation and creative ideas from researchers. In terms of musical ideas,

researchers are interested in the unique and distinctive sound of paralon. The uniqueness of this sound inspired researchers to create a new musical instrument made from paralon. Paralon is also easy to obtain, strong, and corrosion-resistant. The limited range of notes is not an obstacle; in fact, it is the strength of the SATB paralon musical instrument. As material to enrich the study of this paper, it is necessary to carry out further research related to paralon by involving universities, academics, and practitioners related to paralon musical instruments. Second, the government develops literacy in making musical instruments.

#### **AUTHOR CONTRIBUTION**

DJ Dimas Phetorant: Conceptualization, Methodology, Writing-Reviewing and Editing.

Uus Kusnawan: Investigation, Visualization, Idea.

#### **ACKNOWLEDGEMENTS**

The author would like to thank the Ministry of Education, Culture, Research, and Technology, Directorate of Research, Technology, and Community Service, as well as Institut Kesenian Jakarta, for their invaluable support.

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