CLASSROOM CONCERT GUIDE

FOR THE PHOENIX SYMPHONY BRASS QUINTET

Written and developed by:

Jordan Drum
Education Assistant
The Phoenix Symphony
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Academic Standards Alignment

The lessons in this guide align with the following Arizona Academic & Common Core Standards:

ARIZONA MUSIC STANDARDS:
ST1, CO5, PO1 (Grade 1): Recognize melodic movement as up and down
ST2, C2, PO1 (Grades 1-2): Discover, recognize and explain uses of music for historical functions
ST3, CO1, PO3 (K): Identify sounds as high and low
ST3, C1, PO4 (Grades 4-5): Identify music examples by culture and genre
S3, C1, PO1 (Grade 1): Identify melodic shape/pitch direction

ARIZONA COMMON CORE MATH STANDARDS
K.OA.3: Decompose numbers less than or equal to 10 into pairs in more than one way
1.OA.1: Use addition and subtraction within 20 to solve word problems

ARIZONA SCIENCE STANDARDS
ST1-CO3-PO1-K: Organize objects[...]according to various characteristics

ARIZONA SOCIAL STUDIES STANDARDS
ST1-C1-PO1 and PO2 (Gr. 1-3): Place historical events in chronological order on a timeline
S1-C1-PO4 (K-3): Use primary source materials to study people and events from the past
Despite their name, brass instruments are not always made of the metal called brass; in fact, they are often made of combinations of different metals, or even non-metallic materials, like wood or animal horn. So why do we call them all brass?

The brass family, like every other instrument family, is grouped mainly by how they make sound. But more on that later. First, let’s get to know some instruments.

Though there are many brass instruments, in this guide, we’ll focus on the members of the brass quintet, a popular ensemble consisting of the five brass instruments found in the orchestra. We’ll examine each individually, from highest pitched to lowest pitched:

- Trumpet (two in a quintet)
- Horn (or French horn)
- Trombone
- Tuba

The trumpet is the oldest brass instrument, dating back to around 1500 B.C. It is also the highest brass instrument in terms of pitch, which makes it well-suited for playing melodies and other feature parts. Like most other brass instruments, it uses valves to change pitch.

The horn (sometimes called the French horn in the U.S., despite its German origins) cannot play quite as high as the trumpet, but it can go much lower. It has such an interesting shape because it is actually two separate horns that are combined, allowing the horn player to switch between them. This results in an increased range of pitches that the horn player can reach. It also uses valves to change pitch.

Meet the Instruments

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Instrument Design: Valves

Brass instruments without valves can only play a limited number of pitches or notes. Valves allow brass players to change the length of the instrument they are playing by rerouting the air through different tubes. The invention of valves allowed brass players to play many more notes than were previously possible.
The trombone is the only brass instrument in the orchestra that does not use valves. Instead, a trombone player uses a slide to lengthen the instrument, resulting in a lower sound.

The tuba is the largest and lowest of all the brass instruments in the orchestra. If you were to uncurl the tuba’s loops, you would have around 18 feet of tubing! Like the trumpet and the horn, the tuba uses valves to change pitch.

Put all of these instruments together (including two trumpets) and you’ve got a very flexible ensemble known as the brass quintet. Other brass instruments (like the flugelhorn, euphonium or bass trombone) can be substituted in as well. Brass quintets are very versatile, meaning they can play many genres of music, from Renaissance pieces to jazz and funk tunes.

How do they produce sound?

If you’ve ever tried to blow through a paper towel roll, you know that blowing alone won’t get you much more than the sound of air passing through the tube. Brass instruments are the exact same; it takes more than air to get them to make their majestic, melodious sounds.

So what’s the secret? Buzzing. Not like a bee, but the kind you can do with your lips (which some people call a “raspberry”). This buzzing creates vibrations in the air that produce sound and give brass instrument their distinct character.

Yes, believe it or not, professional brass players make their living in part by buzzing their lips really, really well. So give it try; buzzing your lips might get your neighbor a little wet, but it’s the only way to create sound on a brass instrument. Which leads us to our next topic... how does the vibration of lips create sound? For answers, let’s turn to science.

Instrument Design: Mouthpieces

Brass players are amazing “buzzers,” even off of their instruments. But they need mouthpieces, which are sized for each instrument, to direct their buzzing into the instrument, which projects the buzz as a pitch. Like other parts of the instrument, they are made by mixing several different metals, like tin, zinc, silver, copper, or gold.
So far, we have examined four popular brass instruments and how brass players make sound on their instruments. For us to dig deeper, we need to explore the science behind brass sounds.

Brass instruments, no matter what shape they are or material they are made from, are essentially long tubes. As we mentioned earlier, even the tuba can be uncurled to form an 18 foot-long tube.

For anything to make a sound, whether it is an instrument in the string family or the percussion family, there must be some sort of vibration. Vibration of an instrument causes air particles to move, which create sound waves that travel through the air to your ear, where they are translated into sound. Brass instruments are no exception; the vibration of the air is caused by the buzzing of the lips in the mouthpiece. This, in turn, makes the air inside the tube form waves which can be closer together or farther apart depending on how hard and fast the player buzzes.

If a brass player blows harder and increases the pressure in the tube, it looks like this:

Notice that there are more waves in the second image. Thus, the vibrations are faster and closer together and the pitch produced by the brass instrument will be higher.

So, we understand how air behaves inside of brass instruments. But, besides blowing more or less air, how do brass instruments change pitch? Well, that’s where valves or slides (in the case of the trombone) come in. Valves simply reroute air to make the total tube length longer, while slides can extend to do the same thing. Check out this diagram:

When the valve is open, the air flows directly through this tube:

But when the valve is closed, air has to travel further, lowering the pitch.

When the valve is down, the air must flow through a longer tube, which makes the pitch produced lower. When the valve is up, the tube becomes shorter again, which makes the pitch produced higher. Each valve is a different length, so the musician can choose how low they want to go by pressing the correct valve or valves. It’s as simple as that.
Music for Brass

Brass instruments have a bright, piercing sound that makes them perfect for a variety of situations. Throughout their history, brass instruments have introduced kings, led troops to battle and celebrated great victories. The genres listed below are only a sample of the ways brass instruments have influenced music throughout history.

**Hunting and Heralding**
The distinct sound brass instruments create makes them perfect for outdoor use. In ancient times several cultures from all over the world used horns to signal the beginning of sport matches, announce the arrival of kings or signal troops during battle. Sometime around 1400 instrument makers began to put a curve in the metal instruments and, not long after that, the hunting horn (or bugle) emerged. These horns were used for signaling during hunts, both to hunters and to hounds, due to the fact that their sound traveled much further than the human voice. Bugles were used in military settings for hundreds of years.

**Brass Bands**
Brass bands are distinct group of instruments that became popular during the Industrial Revolution of the 1800s when villages and local industries in England began forming these ensembles to promote community. As instruments were mass produced, their popularity spread, and eventually competitions were staged and brass bands became a point of civic pride. These bands then spread to former British colonies (like the United States, Australia and New Zealand) where they took on their own character. Other European countries (in particular Eastern European countries like Serbia, Macedonia and Bulgaria) also have a rich brass band tradition which is much different from the British variety.

**Jazz and New Orleans Brass Bands**
During the late 1800s, Military bands in the United States used brass instruments more than most other ensembles. In the American South, and in particular New Orleans, Louisiana, these instruments (as well as marching bass drums and snare drums) were used for extravagant funeral processions. Eventually these groups meshed with dance bands to form jazz bands. In modern jazz bands, the trumpet and trombone are two very important instruments. Down in New Orleans, the tradition of marching brass bands is still alive and well. These groups, called Second Line bands, use trumpet, trombone, tuba, saxophones and percussion.

**Marching Band**
Marching instruments were initially used to direct the movement of troops on the battlefield. As this tradition died out, these bands became more ceremonial, and eventually became associated with college and high school football teams as entertainment. Although non-brass instruments were eventually incorporated into these ensembles, brass instruments continue to play a vital role in these groups. Their sound is loud enough to carry over even the loudest football fans. Modern marching bands can grow to have several hundred members.
<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valve</td>
<td>The only brass instrument that slides between notes.</td>
</tr>
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<td>Buzz</td>
<td>Push this to lengthen a brass instrument and lower its pitch.</td>
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<td>This instrument is sometimes called French and was once used for hunting.</td>
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<td>Slide</td>
<td>Instead of a valve, move this on a trombone to change pitch.</td>
</tr>
<tr>
<td>Trumpet</td>
<td>Buzz your lips into this to make a sound on the instrument.</td>
</tr>
</tbody>
</table>
Lesson: Brass Development

(Music/Social Studies)
Suggested Level: Grades 1-5

Time:
40-50 minutes

Standards
Music: ST3, C1, PO4 (Grades 4-5): Identify music examples by culture and genre
ST2, C2, PO1 (Gr. 1-2): Discover, recognize and explain uses of music for historical functions
Social Studies: ST1-C1-PO1 and PO2 (Gr. 1-3): Place historical events from content studied in chronological order on a timeline
S1-C1-PO4 (K-3): Use primary source materials to study people and events from the past

Objectives:
TSW compare and contrast various brass music genres using musical terms and descriptions.
TSW participate in creating a timeline detailing the emergence of new brass ensembles.

Materials:
-Chalk/dry erase board or projector
-Picture printouts of various bands and ensembles (available on the next page)
-Recordings of the following ensembles:
  -Military calls: http://www.youtube.com/watch?v=PFRWkldtsQ&feature=relmfu
  -British brass band: http://www.youtube.com/watch?v=P6VX1iP9_DM&feature=relmfu
  -New Orleans brass band: http://www.youtube.com/watch?v=LOluh_1_rlw&feature=related
  -Modern marching band: http://www.youtube.com/watch?v=tGelF5KuHpg&feature=relmfu

Instruction:
Begin by explaining that brass instruments have been used in various ways throughout history (refer to page 6). Have students listen to recordings of each ensemble. Then, as a class, assemble a timeline on the board, listing each ensemble in the correct chronological order with a corresponding picture (from page 9):
Signal/hunting bugles: BC-1900; English brass bands: 1800s-present; New Orleans brass bands: 1900-present; Modern marching band (1950s-present). Students should answer the following writing prompts and/or discuss the topics as a class:

How does the music from the ensembles we studied differ from each other? How are these different types of music the same?

How do each of these ensembles use the distinct properties of brass instruments (loud, portable) in their music?

Describe how each new ensemble is related or different from the ensemble before it (e.g., English brass bands took brass instruments out of a military use and into civilian life and they did not have wearable tubas, or “sousaphones,” like some later ensembles).

Expand the lesson by having student groups research and report on these ensembles.
Lesson: Brass Development

New Orleans Brass Band

Military/Signal/Hunting Bugler

College Marching Band

English Brass Band
Lesson: The Kimbone

(Music/Math)
Suggested Level: K-1

Time:
35-45 minutes

Standards
Music:
S3, C1, PO1 (Grade 1): Identify melodic shape/pitch direction
Math:
K.OA.3: Decompose numbers less than or equal to 10 into pairs in more than one way
1.OA.1: Use addition and subtraction within 20 to solve word problems

Objectives:
TSW use several combinations of whole numbers to add up to integers between 1-10.
TSW understand the relation between length of an instrument and its relative pitch (longer=lower).

Prerequisites:
Students should be familiar with this guide (especially page 5).

Instruction:
This lesson would work well in the context of a unit exploring how several numbers can add up to the name sum or to reinforce word problems in 1st grade.

The students can be presented with the following prompt on paper or verbally:

The American Brass company has invented a new brass instrument, the Kimbone, and they need your help making the owner’s manual. The owner’s manual will help the proud owner of a new Kimbone know which valves to push to make the right notes and change pitch. As you know, pushing down valves makes the total length of the instrument longer, which lowers the pitch. To make the right notes, the instrument must be at the correct length. The American Brass Company needs the owner’s manual to explain all of the different ways you can combine valves to make the following lengths.

On the Kimbone, the 1st valve adds one inch to the length of the instrument, the 2nd valve adds 2 inches to the length of the instrument, the third valve adds 3 inches to the length of the instrument and the fourth valve adds 4 inches to the length of the instrument. For the new owner’s manual, we need every possible combination that adds up to 1-10 inches.

Have students use the worksheet on the following page. After they’ve completed their worksheet, ask them if the Kimbone is going higher or lower as more and more valves go down (they should answer “lower,” as the Kimbone gets longer as the activity progresses, meaning the pitch it creates will be lower). If desired, and you have access to a piano, reinforce the idea using the following language:

“Let’s say that the Kimbone, without any valves down, sounds like this [play ‘C’]. Now, when we put down the 1st valve, and the Kimbone gets one inch longer, it sounds like this [play ‘B’]. At two inches, it sounds like this [play Bb/A#].” Continue down the chromatic scale for each length: 3 inches = A; 4 inches = Ab/G#; 5 inches = G; 6 inches = Gb/F#; 7 inches = F; 8 inches = E; 9 inches = Eb/D#; 10 inches = D.
Lesson: The Kimbone

Worksheet

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Kimbone Valve Lengths
1st valve: 1 inch
2nd valve: 2 inches
3rd valve: 3 inches
4th valve: 4 inches

Example: You can get 4 inches by using the 4th valve alone or the 1st and 3rd valves together.

1 inch ___________________________________ 2 inches ______________________________
3 inches _________________________________ 4 inches ______4th; 1st and 3rd
5 inches _________________________________ 6 inches ______________________________
7 inches _________________________________ 8 inches ______________________________
9 inches _________________________________ 10 inches ______________________________
Lesson: Tubular Pitches

(Music/Science)
Suggested Level: K-2

Time:
25-35 minutes

Standards
Music:
ST1, CO5, PO1 (Grade 1): Recognize melodic movement as up and down
ST3, CO1, PO3 (K): Identify sounds as high and low

Science:
ST1-CO3-PO1-K: Organize objects [...] according to various characteristics

Objectives:
TSW recognize that longer instruments tend to produce lower pitches.
TSW use their listening skills to assemble a musical scale.

Materials:
-A set of Boomwhackers (at least six, but the more, the better): [www.boomwhackers.com](http://www.boomwhackers.com)
-Timer/stopwatch
-Blindfolds (at least four)

Prerequisites:
Students should be familiar with this guide (especially page 5) or have some background knowledge relating length of a vibrating object to pitch (i.e., longer = lower pitch).

Instruction:
The object of the activity is to sort the Boomwhackers from lowest to highest using listening and touch; the group that accomplishes this first wins. Students should use their ears and sense of touch to accomplish their goal. This game can be done tournament-style, where two teams face up against each other and the winner advances, or time trial-style, where the fastest time wins. Either way, the process is the same:

Review that longer instruments produce lower sounds. Ask the class how that might apply to the Boomwhackers you’ve placed out. Divide the class into teams of two or three. Each student should have a blindfold. Scramble the Boomwhackers so that they are out of note order. Start the timer, and stop it when the group feels that their instruments are in order.

After they’ve taken their turn, have them look to see if their order is from longest to shortest. If it is, then they’ve assembled the tubes in the correct order.
Guide Assessment Matching (pg. 7)

Valve
- The only brass instrument that slides between notes.

Buzz
- Push this to lengthen a brass instrument and lower its pitch.

Tuba
- This instrument is sometimes called French and was once used for hunting.

Mouthpiece
- This is the largest and lowest of the brass instruments.

Trombone
- Do this into a mouthpiece to make sound on a brass instrument.

Horn
- The oldest and highest brass instrument.

Slide
- Instead of a valve, move this on a trombone to change pitch.

Trumpet
- Buzz your lips into this to make a sound on the instrument.

Answers to “Kimbone” Lesson (pg. 10)

1 inch: 1st valve
3 inches: 1st & 2nd
5 inches: 2nd & 3rd; 1st & 4th
7 inches: 3rd & 4th; 1st, 2nd & 4th

2 inches: 2nd valve
4 inches: 1st & 3rd; 4th
6 inches: 2nd & 4th; 1st, 2nd & 3rd
8 inches: 1st, 3rd & 4th