

# Subject Based Activities

## Science:

The connection between science, music and inventing is very strong. Without science the ideas of inventors would never have the chance to be brought to life. Science and its rules bring those ideas to life. The following activities will allow students to explore the concepts of science that are connected to music. The **orange words** connect to the Study Unit Lessons. Follow the link to the lessons and explore.

1. **Sound is Vibration (Influence)** – On the most basic level, music is vibration. For a sound to be produced there needs to be vibration. This is most easily seen when looking at a stringed instrument but can also be felt with the human voice or touching the bell of a brass instrument. The following activities will allow students to explore these vibrations:
  - **Catching the Wave (Influence)** – Find a guitar that can be used for some exploration. Pluck a string and look at it move. Notice the wave as the string vibrates back and forth causing the sound. Pluck a lower string and a higher string and note the differences in the size of the wave. Now look at the following instruments and see if you can discover what is vibrating to produce the sound:
    1. Saxophone
    2. Tuba
    3. Clarinet
    4. Bass Drum
    5. Trumpet
    6. Piano
    7. Cymbals
    8. The Voice
  - **Tuning Up The Sound (Influence)** – Using a rubber band, hold it with your fingers and pluck it. As it vibrates pull the rubber band tighter and notice what happens to the sound. Do this several times and record the results. Try the same experiment using a guitar. Loosen a string, pluck it, and then tighten the string. Record the results.
  - **Making the Sound Louder (Influence)** – Amplification is a major development in the music we listen to today. Les Paul found a way to amplify his guitar so people could hear it better. Explore how an amplifier works. Consider how vibration is turned into an electrical impulse and then transferred to the amplifier. Use an electric guitar to explore the use of volume and resonance compared to an acoustic guitar.
  - **Seeing is Believing (Influence)** – Watch the following videos that describe the connection between vibration and sound:
    1. Magic School Bus Episode:  
<https://www.youtube.com/watch?v=ZxYmPAEW840&cuid=187d46d7adcd24285deb49c34ac5d20d>
    2. Music in slow motion – Guitar, Bass, Drum Kit, Piano, and Violin:  
<https://www.youtube.com/watch?v=QXjdGBZQvLc>

3. Cymbal Crash in Slow Motion Showing Vibration:

<https://www.youtube.com/watch?v=W4s2UwKm7dc>

4. Guitar String Vibrations from Inside the Guitar:

[https://www.youtube.com/watch?v=bk\\_TlayFH7c](https://www.youtube.com/watch?v=bk_TlayFH7c)

5. Sound is Vibrations: <https://www.youtube.com/watch?v=MFLeGJclQil>

(Please Note: Monitor students as these videos appear on YouTube)

- **Sound Brought to Life (Influence)** – Create a Vibration Organization by creating instruments from available items such as cans, cardboard boxes or anything that vibrates to make a sound. In writing the composition make sure to give your organization structure with a clear beginning, middle and ending. Notate the composition and share the performance with others.
2. **Build It Yourself (Roots and Beginnings)** – Re-create some of the ideas that inspired Les Paul. The following activities will allow students to experience the same things that he did in creating his inventions:
- **Talking By the Vibration Phone** – Make a simple telephone with two cups and a string. Connect the string to the bottom of the cups by poking a small hole on the bottom and tie a knot to connect the two. Pull the string tight with one person putting a cup to an ear listening and the other person to the mouth and talking. Record your results including how the sound is transferred.
  - **Give Me An “M” – Megaphone** – Build a simple megaphone and experiment on the effect it has on the volume of your voice. Have two students on opposite ends of the gym try to have a conversation with only a normal speaking voice. Record the results. Now use megaphones and have the same conversation while still using a normal speaking voice. Record the results from the second experiment and compare it to the first.
  - **Pipes of Pan** – Construct a simple version of the pipes of pan using cardboard tubes or PVC piping cut to different lengths to create a scale. Compare the sounds when tapping on them with a closed cell rubber paddle or buzzing your lips to create the sound. (Boom whackers also work very well for this experiment)
  - **The Bouncing Ball** – Build a simple drum with a coffee can and plastic top. Place a marble on the plastic top and with a stick strike the plastic top. Notice how the marble is placed into motion. Try containers of different sizes and compare the results.
  - **Tuning in the World** - Build a simple crystal radio with your class after watching this step-by-step video: <https://www.youtube.com/watch?v=VqdcU9ULAIA>. See who can pick up the most radio stations, who can get the clearest sound, and who can pick up the station that is farthest away. Crystal radio kits are also available from hobby stores and science supply companies.

- **Create Your Own Vibration Experiments** – Have students explore the concept of vibration and its relationship to music by creating and trying different experiments. Like all good scientists, make sure to record the findings and compare the results. Try to bring out the spirit of exploration that Les Paul used in his inventions.

**Math:**

Math and music are closely related both through the use of the mathematics of sound and economics. The following activities will allow students to explore this connection.

1. **Math and Music (Roots and Beginnings)** – Pythagoras (6th Century BC) is considered the father of modern mathematics but is also responsible for the development in fundamental construction of the musical scale specifically using stringed instruments. Explore the following activities to discover how length of a string and tension can affect the musical note that is produced:
  - **Higher and Lower** – Stretch a rubber band to different lengths and then pluck it. Graph the pitch (how high or low the note) of the note on graph paper. By measuring the length that the rubber band is stretched see if it is possible to estimate the connection between the length of the rubber band and the pitch produced.
  - **Frets and Strings** – Guitars are fretted instruments (the ridges on the neck) and these frets help to produce the different notes. Place your finger on each fret and pluck the string. Move to the next fret and notate the change. Each fret equals a half step interval – the distance between two notes. Note that the frets become closer as your fingers move down the neck. Note if there is a change in the interval, as the frets get closer. Using this information determine how many frets will need to be moved to get the interval (number of half steps between notes) listed.
    - Whole Step = D to E
    - Major Third = D to F#
    - Perfect Fourth = D to G
    - Open Fifth = D to A
    - An Octave = D to D
2. **Math and the Music Biz (On The Road)** – Les Paul travelled around the country with different bands and performers. This requires a manager to make sure that all of the details are taken care of before the performer leaves on tour. The following activity will allow the student to be that manager.
  - **On The Road Again** - Plan a tour for a trio as manager. Use your hometown as the starting and ending point and include two performances along the way. Once income and expenses have been determined, develop a spreadsheet to keep track of the money. Be sure to include the following:
    1. Cost of transportation by car based on mileage
    2. Cost of housing overnight (two hotel rooms will be needed each night of the tour)
    3. Cost of food (three people eating three meals a day for each day of the tour)

4. Cost of equipment rental (rental of sound equipment is \$100 for each performance)
5. Income from the two shows (\$300 for each show)
6. Consider other sources of income to help.

### **Social Studies/Geography: (On the Road)**

As a performer, Les Paul travelled to many parts of the nation. The following activities are intended to provide students with knowledge of geography through mapping his career and an understanding of the time when Les Paul grew up.

1. **Mapping** – The following activities are intended to understand geography and allow students to explore the places that Les Paul lived. By using the satellite feature found on Google maps, students can often see the area as it exists today and through searching the Internet find pictures of the way and area looked when Les Paul lived or performed.
  - **East Side, West Side and All Around the Town** – Les Paul was born and raised in Waukesha, Wisconsin and his legacy continues to be a part of the fabric of the community. On a map, find the following Waukesha landmarks related to Les Paul and complete the activities:
    1. Goerke’s Corners – Found at the intersection of I-94 and Hwy 18, this is the site of Beekman’s Bar-B-Q. Les Paul played guitar and harmonica to entertain people at the restaurant.
    2. Les Paul Parkway – This road starts at E. Moreland Blvd. and Hwy 164 that becomes Hwy. 59 as it loops around the east and south sides of Waukesha turning into Hwy. 59.
    3. Waukesha County Museum (101 W. Main St) – The Les Paul Experience at the Waukesha County Museum includes activities that bring Les Paul’s story to life.
    4. Park Elementary School (210 NW Barstow) – This is the school that Lester Polsfuss attended as a child.
    5. Father’s Repair Garage (109 North St) – Lester Polsfuss was born on June 9, 1915 in an apartment over his father’s repair garage business.
    6. The House Where Les Grew Up (320 St. Paul Ave) – Les and his family moved to a house when he was two years old. The actual home no longer exists.
    7. Wisconsin Avenue Bridge – As a teen Les created his first solid body electric guitar with a two-foot piece of discarded train rail that he and his friends found under this bridge.
    8. The Polsfuss-Hins Motor Co. (456 W. Main St) – Lester’s father, George Polsfuss, was part owner of a car dealership at this location. The actual building no longer exists.
    9. Schlitz Hotel (294 W. Main St) –Lester’s father was also proprietor of this Waukesha hotel from 1918-1919.
    10. Waukesha’s Five Points (Corners of Main St, Broadway and Grand Avenue) – Les often rode his bicycle down Main Street. He bought his first microphone at a shop located in this area of downtown Waukesha.

11. Goff’s Restaurant (800 Clinton St) – To promote the car dealership, George Polsfuss drove his car around Waukesha, often with his son Les in the front seat. The rides frequently ended at this restaurant for lemon meringue pie.
12. Les Paul Performance Center (321 Wisconsin Ave) – As a youth, Les performed many times in what is now Cutler Park’s Les Paul Performance Center. At about 11 years old, while sitting on an Indian mound in the park he learned about crystal radios from a friend. Les built his own crystal soon after.
13. Les Paul Middle School – Central Campus (400 N. Grand Ave) – Les attended Waukesha Junior High and Waukesha High School at this location. The two buildings are now connected and have been re-named after Les Paul.
14. Club 400 (322 Williams St) – The Club 400 is where Les Paul and his wife Mary Ford played guitars together for the first time. When Les Paul’s father and brother bought the establishment, they designed the bar in the shape of a guitar that can still be seen today.
15. Prairie Home Cemetery (605 S. Prairie Ave) – Les Paul chose to be buried in Waukesha next to his mother. The memorial includes his biography and several of his relatives are also buried in the cemetery. Les requested the seats for visitors.
16. The Les Paul House of Sound (in Discovery World, 500 N. Harbor Dr., Milwaukee) – This exhibit shows Les Paul’s Wisconsin beginnings to his world travels, innovating and experimenting at every stop. Explore this exhibit online or in real time to discover the Les Paul spirit of innovation in you.
  - a. Produce a poster, timeline or photo essay representing the significance of each location.
  - b. If possible, visit the landmarks and the Les Paul Experience Exhibit at the Waukesha County Museum.
  - c. View the locations using the satellite image on Google maps. Compare and contrast how the area and buildings look today compared to when Les Paul lived in Waukesha.
  - d. Visit the Les Paul House of Sound at Discovery World in Milwaukee.

- **Movin’ Out** – During his life, Les Paul moved several times to enhance his career.

Waukesha, Wisconsin St. Louis, Missouri	Springfield, Missouri Chicago, Illinois	New York, New York Los Angeles, California Mahwah, New Jersey
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- a. Create a map of all the places Les Paul lived and complete the activities.
- b. Find pictures or other images representative of his time in that location.
- c. Create a poster or photo essay that represents these different locations.
- d. Develop a timeline including the location where Les Paul lived but also including other historic events occurring in that city and the world at the time. Include musical events and styles related to Les Paul and his career.

- **On The Road Again** - Map a route for a Les Paul tour. Select eight places for Les Paul to perform over a four-week time span using one of the cities where Les lived as the starting and ending point. Make sure to use only elements that were available to Les Paul at the time. Consider the following and then complete the activities:
  1. Population of cities selected to perform
  2. Distance between locations
  3. Method of Transportation
  4. Route Taken
  5. Cost of Fuel, Food and Housing
    - a. Compare and Contrast information at the time Les Paul toured and modern times.
    - b. Compare and Contrast methods of transportation between Les Paul and a current performer.
    - c. Compare and Contrast roads available to Les Paul and roads available to current performers.
  
- **On Route 66** – When Les Paul lived in California during the 1940s he traveled by car on long trips and could only use highways like Route 66 to travel. Consider this as you discuss and answer the following questions:
  1. Why did Les Paul travel by car in the 1940s?
  2. Why did Les Paul not use the Interstate highway system?
  3. Route 66 is a highway that goes from Chicago to Los Angeles. Find it on a map and follow it. What do you notice about Route 66 compared to the Interstate highway?
  4. Map the trip from Los Angeles to Waukesha taken by Les Paul and Mary Ford. Consider the amount of time and expense for the trip. Next, map the trip using today's Interstate system. Compare the time needed for the trip and the cost based on these two trips.
  
- 2. **What's The Buzz/What's the News/ What's Happening** – People are a reflection of the time when and where he/she lived. Les Paul is no exception to this and many of his innovations were based on the era and events of the time. Complete the following activities based on the information discovered in the study of Les Paul.
  - Create a timeline for the following decades and include Les Paul events as well as events from Wisconsin, the United States and the world.
    1. The 1920s – a boy and a young performer
    2. The 1930s – beginning to travel and perform
    3. The 1940s – World War II years
    4. The 1950s – playing as a duo with Mary Ford
    5. The 1960s & 1970s – honors and recognitions
    6. The 1980s & 1990s – how the face of music changed because of inventions and legacy
    7. The 2000s to Present – the legacy and memories

- Select one of the decades and create a poster or photo essay.
- Explore one of the cities where Les Paul lived and create a brochure that highlights things to see in that location. Make sure to include things that were there when Les Paul lived in the city. Compare and contrast the city now and then.

### Language Arts: (Influences)

People that create something (musicians, artists, carpenters, bakers, etc.) often have role models to follow before creating something new or different. Les Paul had many role models in his life, and he was always thankful to those people for providing him with the inspiration to go out and do the things.

1. **Heroes and Role Models** – The following activities are designed to allow the student to explore people that built the course of music today. Activities also explore people that are role models to the student.
  - **The People That Inspired Les Paul** - There are hundreds of musicians today that consider Les Paul a role model. These musicians recognize that Les Paul was the foundation for the way music is made today. Les also had people he respected in his life. Choose two people from the list below and explore the life of the person and identify what inspiration was shared with Les Paul in his career. Present the information discovered to your class.
    1. Pie Plant Pete
    2. Django Reinhardt
    3. Thomas Edison
    4. Art Tatum
    5. Fred Waring
    6. Bing Crosby
    7. Joe Wolverton
    8. Rube Tronson
    9. Jim Atkins
    10. Other Student Discoveries
  - **Write a Letter to Your Hero** – Choose a hero or role model and write a letter. Your hero can be anyone that has made a difference in your life. Make sure to mention in the letter the things that make that person your hero. If appropriate, mail the letter to your hero!
  - **Diary of a 15-Year Old Musician** - Imagine you are Les Paul on the road with Rube Tronson and His Texas Cowboys. Write a week's worth of diary entries about life as a 15-year-old touring musician. Be sure to consider the following:
    1. How you feel about being in this type of group?
    2. What it is like getting up on stage every night?
    3. What is it like being away from home?
    4. What new music are you learning?
    5. When not performing at night, what things do you do during the day?
    6. Describe your surroundings on the road.

- **There is Nothing on TV Tonight** – When Les Paul was travelling and performing around the nation people got news and information from the radio and newspapers. Television had not yet been invented so the ways people communicated was quite different. The following activities will explore some of those methods:
  - **Live and On the Radio** – The radio was a major form of information and entertainment. People would sit around the radio and listen to programs, the news and music with most radio shows performed live. Write the following radio spots and share them with the class.
    1. An introduction for the Les Paul Trio
    2. An introduction for Rhubarb Red
    3. A slogan for a product endorsed by Les Paul
    4. A radio interview with Les Paul and Mary Ford
    5. A radio news broadcast about the Paul/Ford car accident
    6. A news story describing the first multi-track tape recorder
  - **All The News That's Fit to Print** – The newspaper was used to communicate news stories as well as stories about people. Most newspapers came out every day so that people could be kept up to date on what was happening. As a class produce a newspaper that tells of activities and events in your school. Here are some items to include:
    1. A headline about an event in your school
    2. A song review of a Les Paul and Mary Ford song
    3. A comparison story between Les Paul and a current guitar player
    4. An advertisement about a product used by guitarists
    5. A comic strip about Les Paul
    6. A concert review
    7. A news story about an invention by Les Paul

**Physical Education: (Roots/Les & Mary)**

There is a strong connection between music, movement and physical activity. The following activities are designed to incorporate music and movement as well as allow students to experience the music and work of Les Paul.

1. **Les Paul Obstacle Courses** - Create an obstacle course with each station providing a Les Paul fact.

Here are some possible subject titles:

1. Crystal Radio
2. Building an Amplifier
3. The Log
4. Harmonica holder
5. The Les Paul Trio
6. Multi-track recorder
7. Les Paul and Mary Ford duo
8. The Car Accident
9. Performing in New York
10. The Legacy of Les Paul



- a. **Movement and Dance** – At four stations placed in the obstacle course students should listen to the music of Les Paul and add appropriate exercise motions such as jumping jacks, running in place, etc. Choose one song from each category.
1. Country - Bronco Buster Album
    - a. Midnight Special
    - b. Vaya Con Dios
    - c. Turn Your Radio On
  2. Jazz
    - a. Brazil
    - b. Sleepwalk
    - c. Lazy River
  3. Blues
    - a. Bye Bye Blues
    - b. Song in Blue
    - c. Wabash Blues
  4. Popular Music
    - a. How High the Moon
    - b. Lover
    - c. Mockin' Bird Hill
- b. **Stage Names and Nicknames for Lester Polsfuss** – At four stations placed in the obstacle course students should review pictures when Lester Polsfuss went by the following names:
1. Red Hot Red
  2. Rhubarb Red
  3. Les Paul
  4. Wizard of Waukesha
2. **Exploring Musical Styles Through Movement** – In his career Les Paul performed music in several different styles. These different musical styles came with movements that are indicative of the culture of the time. Recreate those dances/movements with Les Paul songs in different styles.
3. **Exploring Rhythm and Pulse** – Music intended for dancing is closely tied to rhythm and pulse as the basis for movement. Explore the following activities with the music of Les Paul.
- Students should move, clap, walk or run to the beat of the music of Les Paul. Be sure to try songs at different tempos and compare how the change in tempo affects the movement used.
  - Choreograph a Song - Students should develop a unison dance for the chorus of a song. Students can dance freely during the verses and then join together into the unison dance moves for the choruses.

## Art: (Roots)

Les Paul was an innovator that often-used household or easily found materials for his inventions. This spirit should be explored through experimentation and discovery in completing the following activities.

1. **Design your Own Signature Guitar** – Using a cut out of a Gibson Les Paul guitar, create your own design using art supplies in your classroom. Consider the use of color, line and texture in creating this guitar.

2. **Be Your Own Inventor** – Think of something that you would like to create that would be helpful to you or others. It can be any type of invention as long as it provides something that is needed. Follow the steps below:

- Identify the item. Do a series of drawings that represent the item.
- Consider the materials necessary to create this new item. See if it is possible to get these items in your class.
- Build a prototype of the item.
- Share the item with your class describing its purpose and use.

3. **Record Company Executive** – Before compact discs and downloads people purchased music on records. A part of that record culture was the cover and record label art. Use the following activities to create your own record cover and label:

- Explore on the Internet some of the artwork found on records.
- Compile a record of 14 tracks (7 on each side) using some of your favorite songs and performers. Be sure to include one Les Paul song on your record.
- Design and create a record cover that represents the theme of the songs selected.
- Using a black circle that is the size of a record (12" in diameter) design and create the record label. Be sure to put the label in the center of the record.

4. **Design a signature guitar pick or drum sticks** – Take the lead and design and create a signature guitar pick or pair of drumsticks. First research what is already out there and then try to create something different and new.

5. **Build Your Own Guitar** – Design and create your own guitar using things found in your home, classroom or school. Use something for strings that will create a vibration and make a sound such rubber bands or elastic. Make sure to consider the elements of sound when designing your guitar.

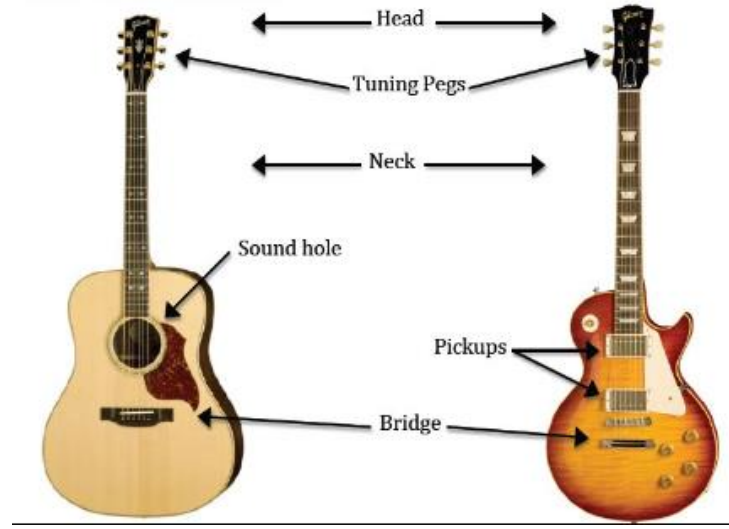
### **Additional Music Activities: (Influences)**

In addition to the music activities offered in the Les Paul Project workbook for general music students, these additional activities are offered to expand learning possibilities to teachers and students.

- **The Human Multi-Track Recorder** – In order to create a human multi-track recorder, students will work together in teams of six or seven to create a “machine” to layer rhythms created using body percussion. The first student lays down the first track by setting a rhythmic ostinato in four. The first student repeats the ostinato for the remainder of activity. The second student lays down the second track starting a rhythmic ostinato that is complimentary to the first track. Each student adds a track in turn by starting a rhythmic ostinato until all the students on the team have entered. After a predetermined number of repetitions of the entire ensemble, each student should then stop the track being performed in turn until all have stopped. Once this process can be completed independently, student teams should perform for each other.
- **You Be The Judge** – Listen to a Les Paul song or entire record and then share a review with your class. Share what you liked, what you didn’t like and why. Also, mention to whom you would recommend his music and why. Next, take a popular song of today and compare it to a song by Les Paul. Be sure to include how the two songs are the same and how they are different. Consider what elements of the Les Paul song exist in the song from today.
- **I Can Name That Year** – Place students in teams and play songs from different decades. After discussion with the team members, the spokesman should state what decade the team thinks the song is from. If the team is correct a point is added to the score. If the answer is incorrect then the next team gets a chance to answer. For best results, use music that is clearly connected to a decade. Here is a list of possible artists and decades:
  1. The Beatles – Music from the 60’s/70’s
  2. Les Paul – Music from the 40’s/50’s
  3. Les Paul and Mary Ford – Music from the 50’s
  4. Bob Dylan – Music from the 60’s
  5. Buddy Holly – Music from the 50’s
  6. The Bee Gees - Music from the 70’s
  7. Madonna – Music of the 80’s/90’s
  8. The Beach Boys – Music of the 60’s
  9. M.C. Hammer – Music of the 90’s
  10. Elvis Presley – Music of the 50’s/60’s/70’s

**Be The Guitar Hero** – Using a computer based multi-track recording program such as GarageBand (Mac computers) or the Loopy App (Loopy App by Tasty Pixel is a download) or other multi-track based recording programs (ProTools, Finale, Sibelius, etc.) have students create a multi-track recording of sound effects. Once comfortable with the computer program, students should create a soundscape using a layering approach to add tracks to the overall composition. The project should then be edited as needed. Once completed, students should perform the composition by playing the project for the class. To view an example of the use of such a project, watch the YouTube video of Jimmy Fallon and Billy Joel performing The Lion Sleeps Tonight: <https://www.youtube.com/watch?v=cU-eAzNp5Hw>

**Same But Different** – One of the most popular models of electric guitar is named after Les Paul. With your class or a parent, visit a music store and take a look at a Les Paul Guitar. Describe as a class what makes it similar to other guitars and what makes it different. With permission, see if you can try to play a few notes yourself. Make sure to consider information from the science activities as it relates to stringed instruments and how different pitches are created. Try to learn an easy song on one string. If it is impossible to examine an actual guitar, use the images on the left to explore the differences and similarities.



**Culminating All School Activity: (Influences)**

Based on an aspect of the life of Les Paul from the list below and using information studied, students will create a multi-faceted broadcast/production. Each curricular area should provide elements to the overall final project. ☑ Broadcast Subjects:

1. Waukesha – Boyhood Home of Les Paul
2. Les Paul - The Early Days
3. What's In a Name - The Names of Lester Polsfuss
4. Heroes and Idols – Those Who Made Les Paul Better
5. Duets and Trios – Who Played Along Side Les Paul
6. Making the Best of Life – Challenges Faced by Les Paul
7. Tours and Travels – The Cities where Les Paul Performed
8. The Inventions of Les Paul – Getting the Idea
9. The Les Paul Legacy – Effects on the Music of Today
10. Student Design A Title and Subject

**Subject Area Assignments** – Students should work collaboratively on a theme and concept.

1. Language Arts Classes – Students should contribute:
  - a. The script for the production
  - b. Assignment of actors
  - c. Develop a slogan
  - d. Create a storyboard
  
2. Social Studies/Geography Classes – Students should contribute:
  - a. Research on the theme
  - b. Information to support writers
  - c. An historic timeline based on the storyboard
  - d. Information for graphs, maps and graphics
  
3. Math/Science Classes – Students should contribute:
  - a. The Technology Required
  - b. Computer Graphics
  - c. A Budget for the Production
  - d. Digitized version of the final production/broadcast
  
4. Art Classes – Students should contribute:
  - a. A Design the set
  - b. The necessary graphics and a poster
  - c. Costumes and props
  - d. Storyboard
  
5. Music Classes – Students should contribute:
  - a. Music for the intro
  - b. The mood of each scene through music
  - c. Placement and choice of music for the production
  - d. A tracking sheet of music used
  
6. Physical Education Classes – Students should contribute:
  - a. The Set and other props
  - b. The stage setting
  - c. Setting the audience area
  - d. Management of the Stage/Set