

Music and Science::

This readings packet deals with Music and Science. The relationship between the two goes back to the origins of civilization and is being revealed further in contemporary science. What is your definition of art? To some, it seems to be -- a cultural additive, something which comments on life after it happens, and the like. The reality is quite different of course. The arts have participated in all aspects of human development, in terms of initiating discovery as well as inspiring the imagination. A good definition of Art and Music, for the purposes of this unit is -- "**The Science of Human Perception**" -- as demonstrated through the creation, presentation and analysis of artistic works.

Here are some facts about the effect music education has on students.

Brain Development::

Early musical training alters brain development. Researchers have discovered that the corpus callosum, the central bundle of nerve fibers connecting the two brain hemispheres, was significantly larger in children who had had musical training, particularly from an early age. Nerves controlling motor functions on each side of the body pass through the corpus callosum. The playing of a musical instrument requires cooperation between the different parts of the brain and improves development.

Language::

Musical development shares 'cerebral circuits' with language. Musical training can enhance the development of language skills. Musical communication is also linked to the emotional systems and musical helps to connect the relationship between sound and meaning. On a fundamental level, the communication between mothers and babies is primarily musical -- lullabies, simple repeated patterns, the melodic contour of vocal communication -- whether in speaking or singing, rhythmic swaying motions, etc. One researcher, in fact, states that "the very existence of music and important aspects of its structure may stem from the relevance of music to infants."

The emotional response you have to music may be a deeper subject than you may have thought. People may feel envy, guilt, shame or disappointment as well as the positive emotions when 'interacting' with music -- we aren't always just sitting and listening. The more experience you have as a listener changes how you hear music. This can improve your experience of life. People carry to music all of the complexity of their lives.

The Mozart effect::

One significant discovery about music recently is called the **Mozart effect**. This expresses the results of a study where 36 college students were given standard IQ spatial reasoning tests. Before one test was ten minutes of silence. Before another was ten minutes of listening to a relaxation tape. Before another was ten minutes of listening to a Mozart piano sonata. The postMozart results were by far the best and the results were duplicated many times. Listening to other 'complex musical pieces' -- like the ones on our listening lists -- have the same or similar results. By complex musical pieces we are referring to music created by people we call 'artistic composers' and whose music can be described as a part of 'The Science of Human Perception' category of music. Sometimes this music is called 'classical' or 'progressive Jazz'.

Researchers also postulate that music has a long-term effect on abstract reasoning skills -- especially when begun at an early age. By 'abstract reasoning' we are talking about the ability to think and to think creatively. Studies have demonstrated improved mathematical reasoning skills, for example. Students have performed, on an average in studies, about 35% better than those who received no musical training. Researchers believe that music can be used as a means to improving higher brain functions. The study of the effect music has on the brain is leading some researchers into the study of higher brain functioning and is making significant contributions to the study of 'artificial intelligence'.

In simple language -- Music makes you smarter! One simple way to see this is in terms of the different 'intelligences' of the brain. We have a sensorial, emotional and intellectual intelligence. Music integrates these functions, gets them all working together. Besides the other art forms, there is no other area of endeavor which does this. One can say that one of the purposes of the arts is to 'demonstrate' the 'complete' human intelligence. This is why many discoveries have actually been initiated by artists and artistic movements.

Discoveries which the arts have initiated, sometimes by hundreds of years include light wave-particle theory, the laws of motion, depth-perception, and the idea that space and time are one.

Here are some key features in spatial-temporal reasoning which musical education can enhance.

Potential Neurological Benefits::

¶ sensory and perceptual -- (auditory, visual, tactile, kinesthetic -- i.e. sensory perception)

¶ cognitive -- (language, reading, 'symbolic' -- where you 'see' the meaning and context of things)

¶ motor -- (fine muscle coordination, skills)

¶ motivational (connection emotion to action)

¶ learning

¶ memory

This is only the beginning -- there is much more in depth and complicated research going on in the area of music and intelligence..... individual brain cells that process melody... the way the ear receives sound waves... how the brain interprets sound and how this affects psychology....

It's funny how so much of modern science goes to prove what the ancient peoples of so many cultures somehow knew instinctively. The ancient Greeks, for example, spoke in depth of the psychological effect of music and how the different modes had their own specific mood and affect on the mind and body of the listener.

Art and Scientific Discovery::

Another benefit of music and art is the development of the Scientific Imagination. This may be the most vital faculty of the great scientists. The examples of such are endless...

Copernicus's mystical writings....

Copernicus, who discovered fundamental facts about the Universe and solar system, had a secret room where he allowed his imagination to be free. He filled it with shards of colored glass and crystals which created all kinds of colored light to flow about the room. He then sat at his desk and wrote imaginative mystical writings.

Einstein's visualizations....

At the core of Einstein's process, and many other similar thinkers, was extensive use of the imagination. He set up situations in his mind and developed his theories of how light and matter relate to each other. He was also a violinist and played Mozart for hours in string quartet settings.

Galileo's interpretations of what he saw through the telescope... and so on.

One may, in fact, think of artistic study as the scientific development of the imagination, the "Science of Perception", and the place to develop 'lateral thinking'. Lateral thinking is where you invent new solutions to problems which seem to have no simple answer, or new answers to old problems -- like thinking sideways. There is no better place to develop this than in music concepts and composition classes, classes which use 'classical culture' as a starting place especially, but which incorporate the 'concepts of music' from other cultures around the world as well.

Questions:::

ANSWER ON SEPARATE SHEET OF PAPER.

- 1] List three different types of music and describe the effect you imagine it might have on the listener. You'll have to think and perhaps be a little creative. You'll need to explain *why* you think some particular kind of music would have the effect you suggest.... use your imagination.
- 2] What is the Mozart effect? -- describe fully (one full paragraph).
- 3] What is the definition of Art offered in this reading? Explain what it means.
- 4] From page one. What is the part of the Brain which is described as 'the central bundle of nerve fibers connecting the two halves of the brain?' What is the significance of this to this discussions offered in this reading?
- 5] At the end of the first paragraph on page two the statement 'people bring to music the complexity of their lives' is made. What does this mean?
- 6] Page two again (bottom) -- List some scientific discoveries which were actually developed by artistic people (people who engage in 'the science of Human perception') ?
- 7] List as many benefits as you can of music training which are described in this reading.
- 8] Write any interesting thoughts which come to your mind as you read this material.
- 9] define 'Lateral Thinking'..... try to give your own example of lateral thinking - a time when you came up with the solution to a problem in life which was original and maybe was different than the obvious one someone else came up with which wasn't working.
- 10] What composer from our listening lists (not Mozart) was mentioned in the *Argument for the Arts* segment? What was the context of mentioning this composer?
- 11] What interested you most from this reading.

PARENT'S (or similar person) SIGNATURE:::

Please sign this after you have taken the time to glance over the material in this packet -- *Music and Science* -- . Please discuss what you've read with the student, so that you may both better understand what this class is about and what a music class is for. If possible, go over the questions and help get answers started. Thank you.

sign. _____

a few of the sources for this material.....

Art and Physics -- by Leonard Schlain.

Brain ,Behaviour, Biology... etc. from *Arts Education Policy Review* , jan-feb 1998 v99 n3 p28(9). -- Norman M. Weinberger.

On the Art of Scientific Imagination from *Daedalus*, Spring 1996 -- Gerald Holton

Music of the Hemispheres.....etc. from *Discover*, Oct 1996 -- James Shreeve

Take Three Chords of Bach Daily, from *New Statesman*, May 29 1998 -- Judy Jones

Spatial-Temporal vs. Language... etc., from *Art Education Policy Review*, july-aug 1998

-- Temple Grandin, Matthew Peterson, Gordon Shaw.

etc.....