

5E Integrated STEM Lesson Plan- Template

Lesson Title: The Incredibly Amazing Wonderfully Fantastic Heart

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Topic: The heart as a pump

The heart and its reaction to exercise

The heart and its reaction to space and excitement

How does the heart work?

What is the heart made of?

How do we hear and measure heartrate/ heartbeat?

Targeted grade level: PRE K

Time Needed: 4-6 lessons

Subject Integration: Science- inquiring into something that occurs in the natural world (ie. the Heart)

Technology- Class is to make simple stethoscopes

Borrowed digital stethoscope where can see heartbeats on computer screen

Borrowed regular stethoscope

NASA film- authentic data gathered from APOLLO 11 Space Mission demonstrating cardiac reaction to first space Walk

Engineering- utilized to solve a problem- how to hear our heartbeats

Plan to construct a rudimentary stethoscope with aquarium tubing, PVC pipe 90 degree elbows, duct tape

Math- counting beats, comparing at rest and then after a short run, collecting real data for comparison

Physical Education- running- gross motor activity

Music- clapping the heartbeats, counting, rhythm

Social Science- history of APOLLO 11

Literacy- story time with age appropriate books-

Hear Your Heart by Paul Showers

Big Book of the Body by Minna Lacey

Justification: Children of this age are learning about the body and how to take care of it (brushing teeth, exercise, eating good food, etc.) Learning about the heart and how it functions supports this.

Integration of the above subjects helps foster relevance and meaning. As well, if more subjects are integrated, there is a higher probability of “hooking” different students, depending on their interests and learning styles. It makes the subject matter more inclusive and levels the playing field.

Standards: There are no NGSS or Common Core standards for the preschool age group as most states do not offer preschool as an option in the public school system. However, I have found that West Virginia does now offer a four year old program in the public schools and has devised standards. In my final essay, I plan to investigate them and apply them here where appropriate.

NGSS Performance Expectation:

Science and Engineering Practices- 1 Asking questions- How does the heart work?
2 Defining problems- What can we do to hear the heart?
3 Developing and using models- making a stethoscope
4 Planning and carrying out investigations- heartrate at rest
vs. after a run
5 Analyzing and interpreting data- resting vs. exercise
heartrates
astronaut’s changing
heartrates- what happens
6 Using mathematical and computational thinking-
counting and comparing

Disciplinary Core Ideas- LS1 Life Sciences- From molecules to organisms: Structures and
Processes- the heart, introduction into the circulatory
System
ETS 1 and 2- Engineering, Technology and the Applications of Science-
Engineering design- construct a stethoscope to solve the problem of
How we hear heart beats
Links among engineering, technology, science and society

Crosscutting Concepts- 1 Patterns- heartbeats and their sounds- lub dub
2 Cause and Effect- resting heartrate vs. after exercise vs. when excited
or nervous (Neil Armstrong on the moon)

Measurable Student Learning Objectives: Students will be able to understand how the heart works in a very elementary way and understand how the heart beats when at rest vs. after Exercise vs. excited

Webbs Depth of Knowledge will be applied in final essay

Nature of Stem: Science- investigating and asking questions about something that occurs in the natural world (one's body) to learn more about how it functions

Technology- utilizing a real stethoscope as well as a student made one

Engineering- design and build a simple stethoscope that works

Math- measuring and comparing heartrates at rest and after running and comparing this data with that of the astronaut sleeping and walking on the moon

The data can be bar graphed using unifix blocks so the children can Observe and compare easily

Engaging Context /Phenomena: The hook that I would use would be to have the children listen to Neil Armstrong's heart beating on his Apollo 11 mission. The children could guess what they think the sound is in a brainstorming session. Most children are fascinated by anything to do with space and astronauts.

Data Integration: raw data being collected by the students as well as auditory and visual data from the Apollo 11 mission. This allows the data to be concrete rather than abstract which aligns with young children's cognitive processes. Comparisons are made of heartrates at rest vs. activity or excitement

Differentiation of Instruction: I am attempting to integrate many modes of instruction to reach all students- auditory, visual, kinesthetic/ tactile (the building and usage of the stethoscope)
Simplifying any of the components of the lesson can also help

Real-life Connection: the heart and how it functions

Possible Misconceptions: the shape of the heart- I think most children will be shocked to learn That the heart is a muscle the size and shape of a fist and not shaped like a valentine

Lesson Procedure 5E Model

Engage: Anchoring Phenomenon- Listening to Neil Armstrong's heartbeat on Apollo11 and not telling them what it is they are listening to. This will facilitate student discussion

Objectives- procedure- Asking the students to guess what it is they are hearing- brainstorming
Meets the criteria of an observable event in the real world
The phenomena of the heartbeat becomes the center of

investigation.

Read about the heart in age appropriate books

Watch videos about the heart

Observe and touch a model of the heart

modifications- By utilizing more than one medium, ie. auditory, visual, kinesthetic, etc. all students will be theoretically engaged

standards, assessments- to be based on West Virginia preschool standards in final draft

resources- <https://latimes.com/projects/la-sci-apollo-11-mission-as-measured-by-heartbeats/>

measured-by-heartbeats/

Kids Heart Challenge Heart Facts

<https://www.youtube.com/watch?2PFWpd> pxm8

Fit Kids 7 Healthy Heart

[https://www.youtube.com/watch?v=\(WBbE5EJz0](https://www.youtube.com/watch?v=(WBbE5EJz0)

Explore: Using a real stethoscope as well as building their own will engage students in hands-on activities that are designed to facilitate conceptual change

procedure- exploring heartrate at rest and after a short run

modifications- helpers needed- Volunteer parents or older students in the upper grades would be fabulous so that the class can be ideally divided into pairs to make and try their stethoscopes

standards, assessments- to be based on West Virginia preschool standards in final draft

resources- Awesome DIY Stethoscope for Kids- Left Brain Craft Brain

<https://leftbraincraftbrain.com/diy-stethoscope-for-kids/>

Explain: Facilitate opportunities for students to explain their understanding of concepts and processes and make sense of new concepts though discussion and circle time

procedure- Once the activity above is done, we can look at the data and have the kids Hopefully figure out that the heart beats faster during activity than at rest. We can then compare what happened to Neil Armstrong's heart at rest and when he walked on the moon.

modifications- If any children have trouble counting, counters can be used or hashmarks can be drawn on a paper. As well, in the Apollo 11 video, one can hear the pace changes in the

heart and see it as there is a beating heart in the corner of the screen for anyone who needs auditory or visual cues.

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resources-<https://www.latimes.com/projects/la-sci-apollo11-mission-as-measured-by-heartbeats/>

Elaborate: Provide applications of concepts and opportunities to challenge and deep ideas: build on or extend understanding and skills

procedure- During this phase, the teacher can lead an open discussion and review with the children what they have learned. This can help reinforce what has been done and learned, as well as, lead to elaboration of the subject through new activities that the children might be interested in. For example- Is it good for the heart to exercise? What else can we do to keep our hearts healthy? What about a puppy's heart? Does it work the same? Do astronauts exercise in space?, etc. The children can then choose what they would like to explore next that can build on what they have just learned

modifications- Some children might prefer to draw about what they have learned or perhaps build a heart out of playdough

standards,assessments- to be based on West Virginia preschool standards in final draft

Evaluate: Assess student knowledge, skills and abilities

procedure, standards, assessments- to be based on West Virginia preschool standards in final draft

modifications- adaptations to meet student needs as necessary, especially if a student is on an IEP(individual educational program), or has a language or learning problem

resources- West Virginia Pre-K standards

<https://wvde.us/wpcontent/uploads/2019/05/PKStandardsBookletUPDATE-FINAL-MAY-2019.pdf>

Teacher Background: The teacher would need a basic knowledge of the heart and circulatory system

resources- Heart 101 National Geographic- You Tube

<https://www.youtube.com/watch?v=CWFyxn0gDEU>

How the Heart Works & Pumps Blood Through the Human

Heart

<https://www.wedmd.com/heart-disease/guide/how-heart-works>

