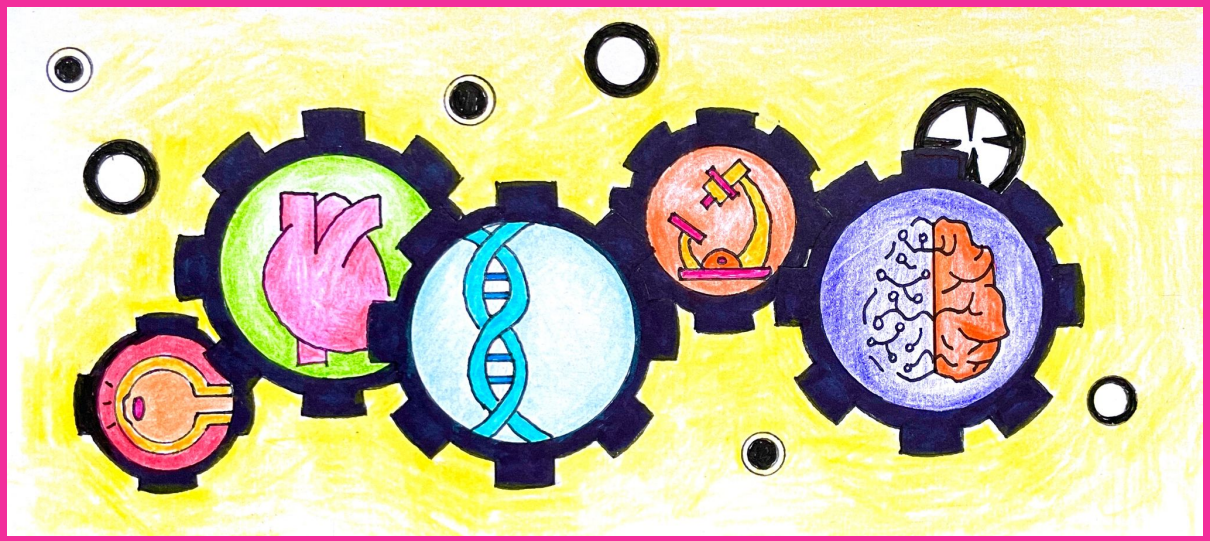
Engineering Within The World of Medicine



Emaryllia's poster on Engineering Within The Medical World

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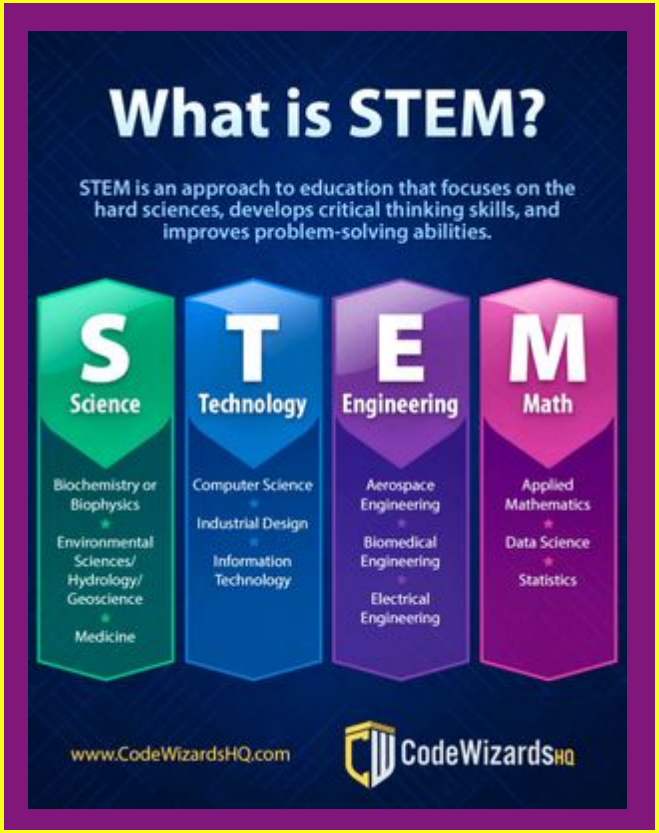
Introduction

Medicine has a STEM base. Science is the fundamental base for medicine. This includes biology, anatomy, chemistry and physics.



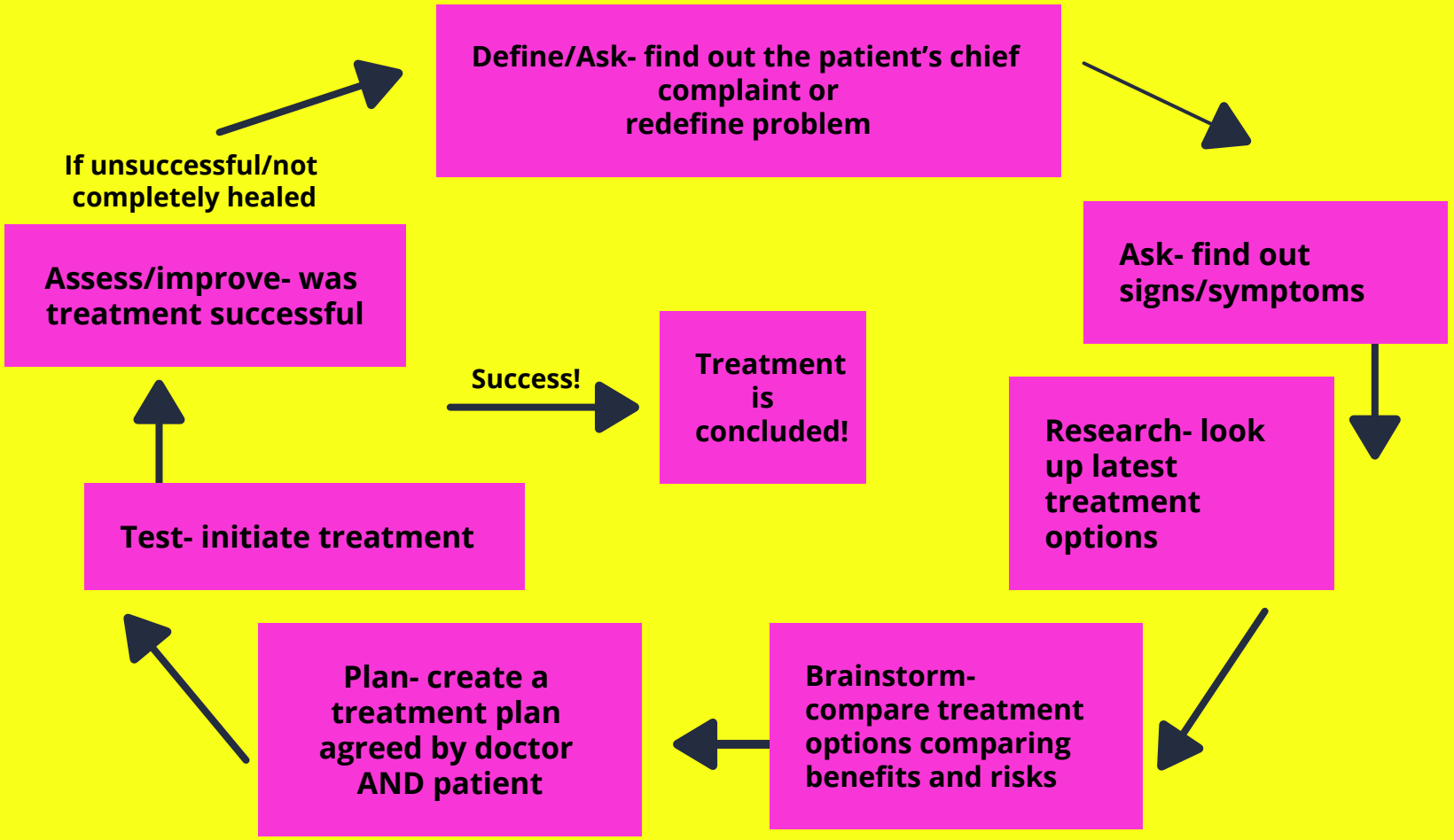
Technology helps with the diagnosis and treatment of patients. Examples of technology are MRI, CT scans and ultrasound to help with diagnosis. Engineers are the creators of this technology for diagnosis and treatment options such as artificial limbs, hearing aids and intraocular implants. Mathematics allows for calculation of dosages for medicines ranging from chemotherapy or antibiotics.

Why I Chose Medicine for The Career Readiness Challenge

My dad has been a great doctor for a long time. He learned in university the engineering design process for creating treatment protocols for patients. There are countless diseases and treatment options. I chose this topic to better understand the decision making process doctors use to treat patients.

Doctor Gafur &
Doctor Gafur Jr.

Patient Treatment Plan/Engineering Design Process



Courtesy of medical lecture notes of Dr. Nick Rai and Dr. Roger Gafur

Patient Treatment Plan/Engineering Design Process

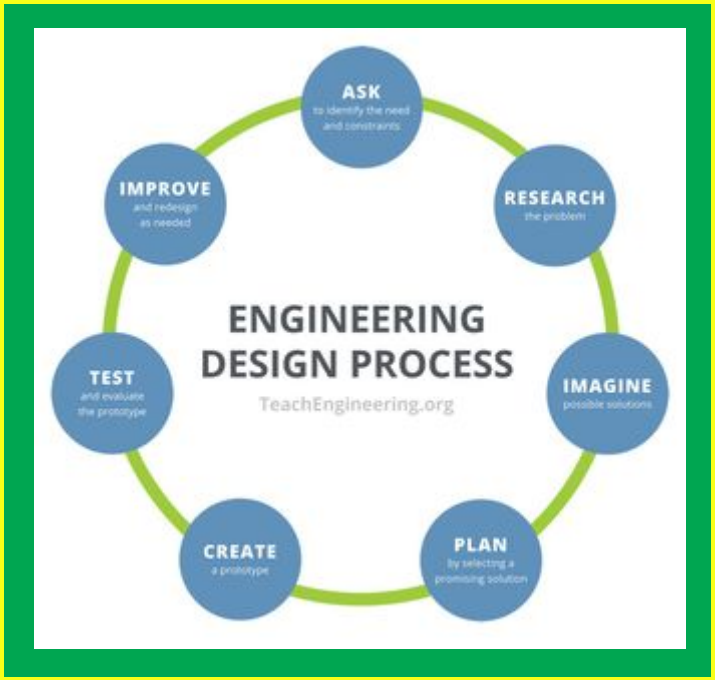
- step 1 – **asking** to get more information. This normally entails a question such as "what brings you in today Mr. Smith?" – the patient states what their problem is. This is **defining** the problem.
- Step 2 – ask the patient for the **signs and symptoms** to help narrow down the diagnosis.
- step 3 – **research** treatment options. The doctor may use certain treatments they know and research for new treatment options.
- step 4 – **brainstorm** the treatment options to make a list of treatment possibilities.
- step 5 – doctor and patient will have a discussion outlining the treatment options including risks, benefits and probability of success. The doctor and patient will then mutually agree to a treatment and **create a plan**

Caduceus - Medical symbol

- Step 6 **test** if the treatment will work.
- Step 7 **assess** if treatment **successful** or **unsuccessful**. If the treatment is **successful** the cycle is **completed**. If **unsuccessful**, the **cycle begins again** asking "was the original diagnosis correct?", "what factors caused this treatment to be unsuccessful?" and "what other treatment options are left?" The treatment cycle continues until either treatment is successful or all treatment options have been tried.

Engineering Design Process

The medical treatment decision making process is quite similar to the engineer design process. This creates a logical, fast and efficient process.



Courtesy of www.teachengineering.org

Engineers and doctors are both presented with an initial problem. Both then research possible solutions. Once a solution is decided upon, both try to apply their plan (construction or treatment). Doctors and engineers will periodically evaluate the effectiveness of their plan and adapt their plans based on the initial results.

When Things Don't Go According to Plan

Even with the professionals best effort, there can be negative outcomes in both medicine and engineering.

Engineers are sometimes given an impossible task. Even though they run countless cycles of the engineering design process, a successful final product cannot be achieved. This is when the professional decides it is time to stop.

Doctors are unable to cure certain diseases even with their best effort. The patient treatment cycle ensures that all possible measures were attempted before admitting defeat. Medical conditions like cancer and ALS are still in the treatment cycle where more research and experiments are being performed to find a cure. I predict, someday, cancer and ALS will have cures. Perhaps, engineering and medicine can combine their efforts and use nanotechnology.

Why Doctors Should Learn Coding

Doctors research to assess the effectiveness of the treatments they provide. This is the Test part of the treatment plan (engineering design process). When a new drug or treatment comes to the market, doctors need to evaluate if the benefits/success rate of the drug/treatment outweigh the risks of possible side effects.
"Python and R programming languages are popular and powerful tools in data analysis and processing. Doctors with good skills in coding will be better at acquiring useful data and analyzing it". (Quote from 9jacodekids.com).

There are an increasing number of apps for monitoring biometrics such as blood pressure, blood sugar and vision. Knowledge of coding can help a doctor choose the most appropriate app.

Freestyle libre for monitoring blood sugar

Lessons Learned from VEX Robotics for My Future Career

Vex robotics competition has helped me prepare for my future career by teaching me how to plan, adapt to change and work under pressure. In order to get my robot to work and play the game efficiently, I had to come up with a logical, efficient and clear game plan. Things will not always go according to plan during competitions. Therefore, I had to be able to adapt to change when unforeseen circumstances arise. I learned how to stay calm and focused when I had to change my initial game plan. I also learned how to use my time efficiently because competitions are run under time constraints. I needed to make sure not to panic and stay focused. Practice on the game field helped prepare for this. I learned the valve of practice. Whether I become an engineer, a doctor or some other career, VEX robotics has taught me invaluable lessons in planning, adapting and focusing.

Conclusion

By following the engineer design process, doctors can improve patient outcomes. By having a modern, logical and efficient treatment plan the amount of trial and error in treatment is drastically reduced.

Doctor Emaryllia

Engineer Emaryllia

References

www.teachengineering.org

www.vex robotics.com

www.researchgate.com

medical lecture notes courtesy of Dr. R. Gafur and Dr. Nick Rai

9jacodekids.com