

Biology:

- Choosing an ecofriendly material accompanied by studying the chemical effect of the material used in building the beam on the environment is essential as some materials may harm the environment and living organisms which will lead to spreading of noninfectious diseases.
- The problem of urban congestion is the main factor that led to spreading of infectious diseases which will affect our society financially, so by solving the urban congestion problem we will eventually decrease the spreading of infectious diseases.
- Geologist may use different type of microscope to examine the soil of arid areas which will at least help in solving it.
- Botanists may use the study of plant cell biology to discover the most suitable plants that can be planted in those arid areas.
- Predicting the environmental factors in some arid areas that may be the cause of some noninfectious disease and solving them in order to exploit arid areas to decrease urban congestion.

Physics connections:

1. We can use the system of measurements in measuring the dimensions of the beam
2. We can convert the measurements of the beam to SI unit which helps us to share our idea with other people from different places.
3. we can use prefixes in converting the metric units of beam dimensions
4. It helps us to be more accurate in our measurements

Hi my best student:

Really I am proud of you so much because of your broad-minded in thinking.

Last session when we discussed about the connection between the biology LOs and your capstone I enjoyed it very much so that I decided to collect all your opinions and thought in this file.

LO9:

- 1- The similarity between the collecting data of the plant tissues structure and function to know which tissue is responsible for protection, storage, photosynthesis process, transporting, strength and support similar that in your cap in which you spent your time to research for the types of renewable energy and how can you use them instead of the nonrenewable energy as it pollute the ecosystem and it will also use of quickly.
- 2- Also each tissue has its structure what prepares it to its specific function (you can give examples as the leaf and the chlorenchyma which their structure prepare them to capture light for photosynthesis process similar that the solar cell which consists of silicon to release electron to produce electricity which capture light and store light).
- 3- The similarity between the xylem and phloem to transport water and mineral salt from the root, stem and organic substances from the leaves, like the wires which use in the cap project to transport the electric energy to operate the devices.

LO10:

1-The plants make photosynthesis process in several step to make their own food as first releasing the electron through light reaction second fixing CO₂ in dark reaction and during cellular respiration through first glycolysis second Krebs cycle and electron transport similar to the transforming the renewable energy to electrical energy occurs through several steps as first capturing the solar energy second release the electrons to produce energy and also water and wind mills which rotate the turbines which rotate and connect with generators to generate electrical energy.

2- The transformation of light energy in chloroplast into chemical energy which stored in glucose which is high energy molecule and the transformation of chemical energy into heat energy during cellular respiration in the plant cells and mitochondria to release the energy for all vital process similar to the solar cell which 1-Solar photovoltaic panels capture sunlight, causing the electrons in the silicon cells of the power panel to be released and become direct current (DC) electricity. 2. The inverter converts direct current into alternating electrical current (AC), 3-making it usable in homes and businesses. And water energy and wind energy which transform into kinetic energy to rotate turbines which connected to generators to transform kinetic energy to electric energy transfer through wires.

LO11:

Similar to the steps of EDP

Connection of math

- 1- We can use trigonometric functions to know the deflection
- 2- We can use angle of elevation and angle of depression to know the deflection (m of arc) by using radian measure
- 3- Sine law and cosine law will help us to get accurate measures of angels for our beam
- 4-

New connections

(other connections that are specifically made based on G10 semester 2 capstone challenge 2022-2023)

Biology :

- The water has the ability to flow and move the turbine to produce electricity due to its unique properties like hydrogen bond, cohesion, and adhesion. The water moves upward in the xylem by capillary action depending on cohesion and adhesion properties of the water.
- The hydrogen ions gradient moves the ATP synthase to produce ATP, the energy currency of the cell. Similarly, water flow moves the turbine to produce energy.
- In photosynthesis, solar energy is harvested as chemical energy in a process that converts water and carbon dioxide to glucose. Oxygen is released as a byproduct. In cellular respiration, oxygen is used to break down glucose, releasing chemical energy and heat in the process.
- The chemical energy of food is the main source of energy required by all living organisms. This energy is transmitted to different trophic levels along the food chain. This energy flow is based on two different laws of thermodynamics:
- The first law of thermodynamics states that energy can neither be created nor destroyed, it can only change from one form to another.
- Second law of thermodynamics states that as energy is transferred more and more of it is wasted.
- Water is perhaps the most important component of any ecosystem. All living organisms need water to grow and survive. In an ecosystem, water cycles through the atmosphere, soil, rivers, lakes, and oceans. Some water is stored deep in the earth. Energy can be generated from this water.
- Experimental design can be compared and contrasted with the designing a test plan for the Capstone to improve the use of alternative energies to reduce our reliance on extracted fuel sources
- Apply understanding of energy use and flow to varied alternative energy processes
- A dwelling's carbon footprint is connected to our contribution to the carbon cycle.
- Improve the use of alternative energies to reduce our reliance on extracted fuel sources, Improve Sources of Clean Water
- Consider ecosystem impact of the Capstone design
- Address the exponential population growth

Physics :

- Volume flow rate through the turbine can be calculated by:
volumetric Flow Rate (Q) = Flow Velocity (V) × Cross-sectional Area (A)
- Horizontal currents are wind driven, fast moving and carries small amount of water; while vertical currents are slow moving, density driven and carries large bodies of water. This makes horizontal currents more suitable for energy production.
- The first law of thermodynamics is the law of conservation of energy. It states that energy cannot be created or destroyed. It can only transform from one form into another. This shows that hydropower generates energy by converting kinetic energy to electric energy.
- In nuclear power plants, the energy transferred by nuclear radiation becomes the thermal energy of water, causing the water to boil. When water boils, it becomes steam. Steam can be used to turn turbines and power an electric generator.

Chemistry :

- Hydrogen bond in water gives it the ability to flow and move the turbine to produce energy.
- Electrolysis is commonly used in energy for the production of hydrogen. Electrolysis uses direct current (DC) electricity to split water into its basic elements of hydrogen and oxygen. Electrolysis of ammonia in wastewater consumes just 1.55 kWh of electrical energy to produce 1 kg of hydrogen. When used as part of a fuel cell, 1 kg of hydrogen can produce 33 kWh of electrical energy.
- The first law of thermodynamics is the law of conservation of energy. It states that energy cannot be created or destroyed. It can only transform from one form into another. This shows that hydropower generates energy by converting kinetic energy to electric energy.
- The low temperature can be used as a free energy resource by freezing water in a confined volume. It is well known that freezing water in a confined volume can create high pressure up to 220 MPa. This force might be utilized and used to generate mechanical energy using a hydraulic motor and utilizing thermochemistry.

Geology :

- There are four main types of hydropower systems, they are :
 - 1- Run-of-river hydropower:
a system that guides the flowing water from a river through a canal to spin a turbine.
 - 2- Storage hydropower:
a large system that uses a dam to store water in a reservoir.
 - 3- Pumped storage hydropower:
a system that uses water in a reservoir along with a pump to force the water to move the turbine
 - 4- Offshore hydropower:
using tidal currents or the power of waves to generate electricity from seawater.
In our capstone, the most appropriate type would be Run-of-river hydropower or Offshore hydropower since they work with the horizontal flow of water.
- Energy from water is **considered renewable energy** because it uses the Earth's water cycle and gravitational pull to generate electricity.
- Refining transportation fuels requires water, as does producing fuels—for example, mining coal, extracting petroleum, or growing crops for biofuels.

Mechanics:

- Hydropower is electrical energy derived from falling (potential energy) or running water (kinetic energy). The movement of the water turns the blades of a turbine, which is connected to a generator. This converts mechanical energy into electricity.

Connections

By : Maryam Abd El Kareem

STEM Maadi

Bio :

My capstone team functions like the functions in the leaf parts that :

- The leaf in the plant is a very important part as plant leaves are the primary site of photosynthesis that is like the leader in the capstone team as it works for the team and manages the main function in it .
- The mesophyll is the green substance of the leaf that allows the plant to enact the process of photosynthesis that is similar to the research member that is essential in our team because it helps the team in the research process to present the ideas that help us take the idea of a capstone, which is the most important thing in our project.
- Stomata are the small openings on the leaf cuticle, stomata play an important role in gas exchange and photosynthesis. That like the writer in the team that helps the team when writing the main points in the portfolio to exchange the mistakes words and grammar by the correct
- Phloem tubes carry sugar & other organic nutrients made by the plant from the leaves to the rest of the plant that is like the presenter in our team when we present something in the portfolio for the capstone leader and other capstone teachers
- Xylem vessels carry water and minerals from the root to the leaves like a timer in our team that takes the best period of time to finish work that works like water and minerals are distributed on the member of the team like the root

Physics :

- Our capstone talks about how we can make energy from the person. From temperature, coldness, pressure, or movement but from the person.
- we learn in the learning outcome 1 the pressure that rule is $P = \Delta (F) / \Delta (A)$ That (F) referee to the force and the (A) referee to the area. And we can increase the pressure in two way:
- 1-increase the force
- 2-decrease the area
- that we can conclude that we can use the force from the person on the room floor that makes energy. the force which is equivalent to the bodyweight of person ..by generating power unite is installed in shoes and generate power when you walk
- That we can achieve it from use piezo elements PAD in your shoes when you walk.

Chemistry :

- Our capstone challenge talks about make energy from a person or human.
- We learned in chemistry in learning outcome 1 about matters and pure substance ..and as we have pure substance we have pure energy that is included in the human.
- As we can from human make energy ...from walk or move or his heat or pressure and another thing...
- And you like the elementary particles (neutrons and protons and electrons) that are particles in your body when you walk or move
- That you can make energy from walking by something called piezo elements PAD ..and you can make energy from your body by the sound that a wave consists of mechanical vibrations in the air and other substances. We can make from its energy by use Generator version and other things in you can make energy

math :

- Quadratic functions in algebra are any type of the equation $y = ax^2 + bx + c$, where a is not equal to 0, that can be used to solve complex mathematical equations by drawing them into a U-shaped shape known as a parabola. Parabolas are the graphs of quadratic functions.
- We use it in modeling in energy prototype to find the missing values
- when parabola opens upward contains a vertex that is a minimum point .when parabola opens downward contains a vertex that is a maximum point.
- The domain of a quadratic function is real numbers.
- We can use all it in our project

Mechanics :

- As we learned in learning outcome 1 in mechanics the parabola we can use it in our project
- That is talk about In projectile motion, the horizontal motion and the vertical motion are independent of each other that is, neither motion affects the other.
- The vertical motion is the motion-free fall. Most important is that the acceleration is constant. provided we substitute g to a
- we can say that your moving some thing on the earth have a gravitational force or acceleration if we talk about it by a vertical motion to make a pressure on the earth that we can conclude from it energy from pressure and we can calculate it by this law ($s = v_i t$) if it by x-axis or ($S = \frac{1}{2} at^2$) if it Y-axis

بصوا يشيب هي حاجه حابه اقولها ... مبدأيا انا الباور بوينت بتاعي مبضربش حد علي ايدہ
عشان يذاكر منه انا مجرد بحاول احط كله اللي ذاكرته في باور بوينت شكله لطيف يفتح
نفسك علي المذاكره ويساعدك .. نا مبقولش الكلام دا عشان حد انتقد شغلي انا بقول
الكلام دا نصايح ليكم ف الاخر انا طالبه زيكم في سنه اولي بحاول علي قد ما اقدر
اساعدكم يمكن ربنا يجعله في ميزان حسناتي او يساعدك ف انك تحب ماده مثلا بتكرها
الي اخره .. وبحاول احط اقصي مجهود ليا وبحاول اجمع اكبر قدر من المعلومات بفتح باور
بوينتات وفيديوهات وريفرينس وكل حاجه علي قد م اقدر

وشكرا ليكم علي دعمكم حقيقي وربنا يوفقكم



Journals

This is the third week of this semester, you already covered some capstone sessions, and you already did some activities to help you understand the capstone challenge about energy. Mention one activity you still need to do to better understand this semester's challenge, and explain the importance of the activity to you. *

2-Suppose that during your current capstone you learn that you have missed some information (or have a misconception about one idea), and you want to search about that topic. What resources would you use? Explain how to be sure that these resources are trusted. *

3-Your project in this semester aims to use a process by-product as a source of energy. Explain the concept of a "by-product", and give an example of how you might use it as a source of energy

Journal 2

1-This is the second team you have involved with during your STEM life, what was the worst two point that you did in the first semester, and how are you going to overcome one of them through the second semester?

2-The second step of EDP (engineering design process) is research, including reviewing prior solutions to the problem you are solving. Provide a keyword you might use for your search for prior solutions, and give two reasons why this keyword will help you search for prior solutions.

3-our challenge this semester is to produce energy, and in Physics (1.08) you are studying pressure differences in fluids. Your team decides to produce energy to light the pass of Mount Saint Catherine, thus you plan for a field trip to the top of the mountain using a hot air balloon. What time of day or night would your team launch your balloon to achieve maximum lift at launch, and why does Physics suggest you choose that time?

Journal 3

1-time is precious , and every team has a limited time to finish their capstone. Mention two factors that lead to wasting time, and explain how to overcome them.

2-A prototype must be testable to be approved. Explain how to ensure that your prototype will perform this task successfully.

3- You study the photosynthesis process in Biology (BI.1.10). The waste product of photosynthesis can be used to produce energy in other processes of other organisms. Compare this process of using the waste product of one process as an energy source of another process to the solution you chose for your capstone project. *\

Journal 4

1-After studying in your STEM school, a friend asks what Capstones are. Explain what a Capstone is for your friend. Include two benefits you received from Capstones that students in traditional schools missed

In your capstone project you researched topics and prior solutions, and then you developed your solution according to the design requirements and the information you got from testing your prototype. Mention your suggested solution, and then explain how you improved your solution with more information. *

You studied the using heat sources to generate other forms of energy (PH.1.10). In some industries there is a lot of wasted heat produced by conduction, convection, or radiation. For example, in the process of forging metal, the containers glow with heat. Is this an example of wasted energy conduction, convection, or radiation? Explain your answer. *

Journal 5

1-Definitely, you participated in the summer camp at the beginning of your first stem academic year. Mention one point that can be added to the next summer camp program and explain why it would be helpful. Mention another point to be dismissed from the program or improved, and explain why it may not be useful.*

2-According to Engineering Design Process you and your team are at the stage of constructing and testing your prototype. Explain your steps to construct the prototype and how you modified the prototype based on initial results of your test

3-Ch.1.10) Chemistry laboratory techniques (such as filtration, crystallization, evaporation,) are practical skills that play important role to perform various experiments. Suppose a student team had a capstone project that used waste heat as an input to a chemical process. Describe one laboratory technique you might depend on. Mention two precautions you need to consider for safety.

Aliaa el. sawy

(Blue) 1. How does your capstone team make decisions about your capstone project? Do you feel this process is effective? Why or why not?

As we are in STEM school, we have to work in teams to solve some of Egypt grand challenges. These grand challenges need some processes to find solutions for them. In our team, we follow some steps to make decisions. First, we select the problem we need to solve. We discuss the problem between us and ask our teachers. We try to find the most suitable one all over the solutions we found. In our decisions, all of us must respect the opinion of the other members in the team. If someone of us is not satisfied with our solution, we try to understand his opinion. At last, we reach the best solution and follow it. When we try this process we find the solution faster than the past. When we could not select the design of our bridge, we thought about the best designs by searching and asking teachers. We found about 5 designs. We analyzed every design and found the best one for our project. I think this process is so effective and useful. It saves lots of wasted time. We make us understand how to work in a team. It also makes us learn how to analyze problems and find good solution. I hope we are useful to our country and we make a change.

(Blue) 2. There is so much information available on the internet to us now that we must be careful in using it. If you are searching about information and found 3 web pages with different addresses, one ends in ".org", one ends in ".edu", and one ends in ".com". List those pages in order of how much you might trust them starting from the one you would trust more. Then explain why you chose that order.

In STEM schools, we always are asked to make searches about our project. These searches must be very accurate. If the search you made is not accurate, it can add wrong information in your project that can effect it badly. So we must be careful while searching for a specific topic. There are a lot of sources you can search from. We can use references, books, websites and other sources. The most use one is the internet. But there are a lot of websites with different addresses to search from. In my opinion, I list the addresses that I would search from as ".org", ".edu" and ".com". I trust ".org" most as I think it has good and trusted information from all fields. Then ".edu" I trust it too, but I think it contains information about education only and in our school we need information from a lot of fields. The one I trust the least is ".com" as it is supported by

companies and can contain wrong information in order to attract more visitor to this site. So when I make a search I always choose the websites with address ".org".

(Blue) 3. In English you learned to write academic paragraph correctly. Write a paragraph to your teammates to tell them about one of the grand challenges you are going to deal with during your capstone project. Follow the rules of paragraph structure.

In STEM schools we are asked to solve some of Egypt grand challenges. One of these challenges is the population growth. The population growth is a big problem not in Egypt only, but in most of the world. As we are working on solving this problem in our capstone as a team, we must first understand our problem. Population growth is a big increase in the number of people in some areas. This can happen because women bear a lot of babies. This problem can cause a big deal of troubles. It causes urban congestion, pollution and spreading infectious diseases. It can cause poverty because a lot of people use the same amount of everything. This can prevent children to learn in school and make them work in early ages. This problem can be solved by spreading people in the empty areas. We can also build a bridge as the one in our capstone to solve the urban congestion. This problem must be solved before it causes more and more troubles. We must work hard in our capstone to find a solution to this problem. And who knows. Maybe our capstone will be the solution of this problem in Egypt and other countries that suffer from this problem.

What advice would you give to new students about teamwork to help them have a highly effective Capstone team? Explain why you think this is important advice.

As I have been a student in STEM School for a year, I learned during it a lot of skills. I learned from all my friends experience. I learned from teachers. I came to school know nothing about teamwork or how to deal with people. When we came last year, Seniors students told us how to work in a team and how to be an active member at the group. I listened to them and tried to follow all their advice and I gained more experience by myself. I decided to tell them a rule that they must follow to work in a successful group. I advise them to hear, respect each other and to work hard to achieve success for all the group and don't think that one of them did the job, but think that they all did this job. In my opinion, this is the most important advice they should or even must follow. For example, if someone has an idea, all the group must listen with all respect to this idea. By following this advice, they will love working with each other. They will learn that all of them are the same, all of them has his own great job even it was small.

A fictional team decided to address the problem of removing microplastics by focusing on particle sizes from 20 to 100 microns (micron = 0.001 millimeter). They developed a successful robotic mechanical method only to later discover that the largest dangers to our ecosystems are particle sizes from 1 to 20 microns. Using that example, Explain why it is very important to understand and clearly identify the right problem to solve.

As I'm a student in STEM School, we are working every semester on a different challenge. We work hard trying to help Egypt to solve all the eleven grand challenges in it. This semester we are working on solving the problem of pollution of water with the microplastics. While we are working on our capstone, we write a portfolio for our project. A very important base in our project or our portfolio is "the problem to be solved". In working on any project, you must understand firstly what is your real and main challenge that you are trying to solve. For example, One of the prior solutions in removing microplastics from water is a robot that remove all the microplastic particles that is more than 20 microns. However, all the problem is the particles that is less than 20 microns. So, they worked on a wrong solution. They wasted materials and time for nothing. So, we must search very carefully about our problem to be solved. As it is the whole base that lead us to think in an effective solution to help the whole world

For this semester Capstone you are working on Water pollution with Microplastic Water on earth has many resources like Oceans, Rivers, Ground water, and there are many ways that water can be polluted with Microplastics like a type of industry, domestic activities,, which produces an increase of Microplastic amount in water by time. In Math (MA.2.01) you learned how to model real-world situations by using different functions. What is the water source You and your team selected a to work with in your project? Which mathematical Function would you use to describe the changing amount of Microplastic in this water source by time? Explain why did you choose this function?

In this semester, we are working on solving the problem of Pollution of water with microplastics. Water on earth has many resources like Oceans, Rivers, Ground water, and there are many ways that water can be polluted with Microplastics like a type of industry, domestic activities,, which produces an increase of Microplastic amount in water by time. In my group after searching about all these sources, we targeted that we will work on the drinking water from the rivers. In maths, we learn about function and how to use it in making graphs and calculating results. A function is a mathematical device that converts one value to another in a known way. We can think of it as a machine. You feed the machine an input, it does some calculations on it, and then gives you back another value - the result of the calculations. In our idea I think that I will use the polynomial function to calculate the average change by representing the relation between the amount of microplastics observed and the amount of magnetite used.

For example, $f(x) = X^2 + X - 2$, where X is for example the amount of magnetite and f(x) is the change of amount of microplastics

ENW.2.2.1 Write a thesis statement for a process essay that would describe the Engineering Design Process.

As I'm a student in STEM School, we work every semester on a different challenge, and we try with all our efforts to solve this challenge. It is not easy to work on a challenge and find a solution for it, but we all learned how to deal with this. We learned something called Engineering Design Process (EDP).

Engineering Design Process is all the steps you must follow to achieve a successful project at the end. You must search for the grand challenge you are solving. After that, search for the problem to be solved and this is very important to clearly understand what you will do. Furthermore, you must search for all the prior solutions for this challenge trying to avoid any similar ideas. After all of this, you will be able to have an idea to represent. At this point you must experiment your idea by making a small prototype and see your results. If it is correct you have successfully made your project, if not you must retry and correct the mistakes you did.

Finally, from all these steps you will find out that you made a solution and a project because you followed the the right scientific methods in searching and making a project.

Journal 1

As this is your 1st journal at your STEM school, what are you most excited to learn about while at your STEM school and why? Blue

As I am in STEM school, I am very excited to learn a lot of subjects and a lot of skills. STEM schools helps us to learn what we love. STEM schools give us the chance to create. One of the most important skill that I want to learn is the teamwork skill. Because it helps us to improve our self. It helps us to be better. For example: when we have a problem, it is better to work in a team because this helps us to solve any problem. We discuss the problem and exchange ideas to solve it. When we disagree on a problem, we vote for the perfect idea and we try to persuade each other with the most perfect idea. In addition, the most subject that I want to learn is physics. Because physics is the whole world. We use physics every day. For example: in motion, in building. Actually it is the most subject that I want to be expert in it. Physics helps us to understand the life around us. It also helps us to explain each phenomena that happen in the universe.

The STEM schools in Egypt help students prepare to become adults who are helping Egypt solve big problems called Egypt's grand challenges. The grand challenge you will work on for your first capstone is to recycle and retain garbage for recycling. Explain one example of how recycling could solve the problem of limited resources of Egypt. Green

As I am in STEM school, I have to think to help my country. Egypt's grand challenges are very important problems that faces Egypt. Recycling materials and wastes is one of the most important things in the world especially in Egypt. Recycling is the process of converting wastes and garbage into new materials that will benefit us to make new things. A lot

of garbage in the house can be recycled. We can have a lot of benefits from garbage. Recycling materials helps us to solve the lack of resources in Egypt. For example: when we recycle old paper that we don't use, we can benefit from it to produce new paper to write and use it again. We also have a problem in the lack of plastic. By using recycling, we can solve this problem by recycling old and used plastic to produce new plastic materials to use it. Recycling also helps us to reduce the amount of energy that we use, as recycling materials helps us to reduce the amount of the used electricity. For example: we use 70% less energy by recycling materials instead of remanufacturing it. Recycling is very useful in improving the economy by using the material more than one time.

Using your best English skills, write a short paragraph explaining the meaning of "Recycling" as if you were writing to a preparatory school student. Blue

In STEM schools, we learn how to solve Egypt's problems. There are 11 grand challenges that faces Egypt. Recycling is one of the most important problems in Egypt. We have a lack of resources in Egypt. By recycling materials we can solve this problem. Recycling is the process of converting old and used materials into new materials that I can benefit from it. Recycling is to use the material more than one time to reduce the amount of the used materials. Many of the generated wastes in the house can be recycled and reused. For example: we can use and recycle the kitchen wastes, the old bottles, the newspapers,etc. when we do this, we can help Egypt to improve and be better as this helps to produce energy and reduce pollution.

(Blue) 1. If a new student joined your team, how would you help them become an effective member in your team? *

Personal Reflection/Team Collaboration

In STEM school, we have to work in a team to make our capstone. So, we should understand each other and be affective. In our school, new students may come and we can have a new partner in our team. We should help him to understand how working in a team is. Before we started working in our capstone, we were very confused and didn't know how to deal with any of the problems that faced me when I was new in STEM school. Of course, all of us were new so we needed the help of students that are older than us and have experience in working in a team. Our older brothers and sisters helped us a lot to work hard to have the highest marks. They advised us and gave us all what they learnt. Now we have a lot of skills and we should help the new comers and give them all what we learn. If a new member joins our team the first thing to do with him is to make him feel happy with the group. If he is not happy we won't be understanding to each other and there will be a lot of problems between us. We should also give him less tasks to do because he still does not know what to do. We must give him all the information that we learn before he came to be an affective member. At last we should always support him.

(Blue) 2. After searching prior solutions and reviewing your design requirement, you and your team should choose a design for your floating bridge. Which design did you choose for your floating bridge? Why did you choose it? *

Using the Engineering Design Process (EDP)

In our capstone, we are asked to build a floating bridge. So, we make search from many courses to find solutions that are already tried. While searching, we find a lot of designs that look very good and very suitable for our capstone. We continued our search to find the best design. After doing a lot of searches, we finally defined our design. The design that we are working on is different from the other ones. Our bridge have floating boxes under it. The floating boxes make our design more stable and safe. There is one box in each unit under our bridge. This box has a side of a pole that goes around the bridge as a rainbow to reach the other side of the box. The design also contains strings that come from the pole and attach to the deck of the bridge. These strings help us to make our bridge strongest because the poles will support it. We chose this design because we see that it is the most suitable one according to the ideas that we had. It is different, stronger, and have the ability to be stable even in days that

have bad weather and strong waves. We already started doing our prototype and we will test it today to see if the bridge we've chosen is a good solution or not.

(Blue) 3. PH.1.01 - In physics you learned about the difference between measurement accuracy and precision. Give an example of a measurement you might make of your bridge and explain the difference between the accuracy and the precision of that measurement. *

Learning Transfer

In our capstone, we have to make a floating bridge. Building a bridge like that always requires us to measure every step we did to be able to make the best design with the best dimensions. So we use a lot of tools to measure the length of the bridge, the mass and the height of it. While doing our prototype, we had to measure the length of three units of the bridge that are indicated and each one has the length of 4.5 cm. So each one of us in the group started to measure the length of them. When I measured it the length of it was 13.5 cm. and two of my friends got the result of 13.4 cm. and the others measured it by 13.6 cm. so the results of us have both accuracy and precision. Because all of the results are so close to each other so the results are precise and all of them are close to the real result so they are accurate. But while measuring the mass of it that has to be 120 g we got these results: 140.5 g / 141 g / 139.6 g / 140 g / 140.7 g. so all of the results that we got are too close to each other so they have precision. But all of them isn't equal to the real results so they are not accurate. We call these type of error a systematic error which is come from using wrong tool.

Being a student at STEM School requires developing different skills (like English language, Computer skills, group work ...). Mention one skill that you need to develop to be a good student at STEM School, Explain how you would develop it? Blue

As I am a student in STEM school, there is a lot of skills that is important to help us to be better. So, STEM schools require developing our skills to achieve our goals. There are a lot of important skills that we should have like: Computer skills, language skills, teamwork skills...etc. For me, the most skill that I want to develop is the teamwork skill. Teamwork is the most important skill to be a successful student in STEM schools. Working as a team help us to work easily. It also helps us to save a lot of time, to do our job with a better way. Developing this skill is very important thing. To develop the teamwork skills, we should follow some steps. For example,

1. We must learn how to speak politely with our friends. This will help us to respect each other in the team and to respect our different ideas.
2. We should learn how to persuade each other.
3. We should respect our time, not to waste it by fighting and disagreement on the ideas just to show that you have a loud voice.
4. Finally, we should learn that the success of the team means the success of all the members. So, everyone in the team must work hard to make the team successful not on making only himself successful.

Zeyad El Gameel

As you and your team are working on the Grand Challenge of recycle and retain garbage for recycling, you should choose a problem to do your Capstone for this semester. What is the Problem you choose to work on? Explain why it is important to solve this Problem? Blue

There are a lot of problems that faces Egypt and as I am a student in STEM school, I have to think to solve this problems. In our capstone we are working on a big grand challenge which is recycle and retain garbage. There is a lot of garbage in Egypt that pollute the environment and we don't benefit from it but if we recycled this garbage, we will solve a lot of problems. In our capstone, we are making a building block from a recycled materials. This will help us to solve the arid areas, the urban congestion and the recycle and retain of garbage. We chose to work on the arid areas. One of the problems that we are solving is the urban congestion. Our building block will help us to build new cities and new bridges. That will help us to kill the urban congestion problem. Solving this problem is very important for us because it makes a lot of problems for us. For example,

1. It is a main reason of spreading disease.
2. It causes pollution to the environment.
3. It cause a global warming.

So, we must solve this problem by building new cities in the desert.

Zeyad El Gameel

In Chemistry you have learned about Scientific method. Explain how would you use it in your Capstone about recycling materials? Blue

In Chemistry we have learned about Scientific method. Scientific method is one of the most important methods to achieve our goal. This learning outcome helps us to use the scientific method the science reasoning in solving problems. In our capstone we used the scientific method as we first make an observation to the problem. Second, we make some hypothesis to solve the problem. We made some solutions to solve it. Third, we will make some experiments to the solutions. An experiment is carried out to test a hypothesis. This involves gathering new information that enables us to decide whether the hypothesis is true or false, whether it is supported by the new information learned from the experiment. Experiments always produce new observations, and this brings the process back to the beginning again.

Zeyad El Gameel

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Capstone requires teamwork, each member in the team has a role. What is your role in your Capstone group? Why did you choose this role? Blue

As I am a student in STEM school I must work in a team. Teamwork is very useful. Working in a team helps us to be better. It helps us to save our time. Being a part of a team is very interesting. Everyone in the team have a role. This role is decided on his skills. In my team, I am the leader of the team. This is my own role. We decided that I will be the leader of the group. Because I have the skills to this. I can arrange my time well. My team trust me. They put me in this role because they trust that I will help them to achieve our goal. As a result of this role, I have to be hard worker. I must arrange our time. Arrange the time of our meetings. I must be honest between them. I distribute the missions between us fairly. I'm trying to be as they want and as they expect from me. I wish to lead them to achieve our aim.

Zeyad El Gameel

As you and your team are working on the Grand Challenge of recycle and retain garbage for recycling, and you are working according to some design requirements. Mention one design requirement that you are going to work on this semester, Explain how will you test your Prototype for it? Blue

In STEM school, we make a capstone every semester. In this semester we are solving the problem of arid areas and the problem of recycling. We are making a building block to solve these problems. We have a certain design requirements to follow. We must follow these design requirements to make a successful project. Our main design requirement is to make a block with recycled materials. The main component of our block must be a recycled material. We are allowed to use one commercial material and we are not allowed to use any electronic materials. The block must be 30cm length, 10cm width and 2cm thick. The problem here is the thickness of the block. One of the design requirements that the block must be light and very hard to put a big load on it. So, we must make a test plan to test how much will the block load. We have two types of test, dry test and wet test. In the dry test we will hang up a load in the middle of the block to measure the pending of the block until it breaks down. In the wet test we will put five block in the water and make the same test on a one every two hours. Then we will make a ratio between the weight of the block and the maximum load it carried. This will be the score that the block achieved.

Zeyad El Gameel

In physics you have studied about the system of forces, the equilibrium system and newton's third law. Explain how would you use ONE of these concepts in your capstone about building block. Blue

Physics is the most important science in the world. We use physics in everything in our daily life. We use physics in walking, running even in swimming. One of the most important laws in physics is Newton's laws of motion. We use Newton's laws of motion in anything. The motion of the cars, trains and planes. We use these laws even in building. We use Newton's laws of motion is test the building blocks. We use especially Newton's third law. Newton's third law that states on "Every action has an equal reaction". We use the Newton's third law of motion to help us to test our block. We have to test how much the block will carry a load. So, we will hang up a weight in the middle of the block and observe the reaction of the block. When we apply a force on the block, the block is affected by this force and a reaction force is exerted. The reaction of the block will help us to know how much the block will carry. We will use the third law of motion to make sure that block is good to use.

Zeyad El Gameel

Zeyad El Gameel

Capstone requires teamwork, Exchanging experience among team members is an important thing. Mention one thing you learnt from your teammate? Explain why that thing is important for you to learn? Blue

Capstone requires to work in a team. Working in a team is very helpful. It helps us to save time, learning new experiments and Learn how to deal with the time management. As we are in STEM school, we are working hard in a team to achieve our aim. This teamwork adds some skills to us. We are learning from each other. The most important skills that I have learned from my teammates is how to be patient and how to arrange my time. This skills are the most important in working as a team. These skills must be learned to work easily. Time management is very important. It helps us to save our time. It helps us to know how much work I will do today. Being patient and calm also is very important. This skills I have learned from my teammates. I was nervous in the beginning, but now I'm trying to control myself when I'm nervous. This helps us very much. This helps us to remain focus in such a terrible situation. So, we can think more clearly and take the right decision. Actually, I have learned a lot of skills from the teamwork. I have learned a lot from my teammates. Teamwork is very useful in learning a lot of wonderful skills.

Zeyad El Gameel

As you and your team working to have a building block from recycled materials. What is the recycled material you used in your project? Explain why did you choose this materials? Blue

As we are students in STEM School, We were asked this semester to solve 3 grand challenges. One of them was the recycling problem. We were asked to make a building block with recycling materials and we are only allowed to use one commercial material. So, we made a lot of search. Finally after the search, we decided to use the broken ceramics and the broken red bricks. These two recycled materials are very wonderful to be used in a building block. The ceramics have a great properties to give the block the quality to be used in building. For example:

1. High hardness and strength, this is actually the most important property in the ceramics.
2. High melting point, this give the block the ability to resist heat.
3. Light weight, it has a light weight compared with its hardness.

The Broken ceramics in the factory is useless because they can't recycle it again to form a new ceramic. Making ceramics requires to burn the body of the ceramic in high temperature. So, recycling the broken ceramics to be new ceramics is impossible because we can't burn the ceramics twice. This reduce its hardness. So, all the broken ceramics are useless. We also asked in a bricks factory. They recommended to use the broken red bricks. As we can't use it again. The broken red bricks also is very hard and it will give our block a high strength.

Zeyad El Gameel

In Earth Science you have studied about "Examine common minerals and identify them and differentiate them from other common minerals". Choose ONE concept or ONE skill related to that learning outcome. Define it then explain how would you use it in your capstone about building block. [Blue](#)

Earth Science is very important in helping us to identify the materials that we will use in our block. In Earth Science, we have studied about examining minerals and identify them. In the second LO we studied about the properties of some minerals. We studied some physical properties of some minerals. We studied about hardness, streak, and cleavage. This study helped us to know the properties of the materials we are using. When we were searching about our idea. We decided to use the broken ceramics as a recycling material. We found that ceramics have a lot of properties that will give our block a high strength. The main component in the ceramics is Feldspar. Feldspar has a high hardness. Feldspar is very useful in making building blocks. It is also used in making the ordinary building blocks. So, this helped us to choose the ceramics as a recycled material. So, we used this concept to identify the recycled material that have used. When we know the properties of the materials we could know the properties of our building block.

Zeyad El Gameel

Q1:

I think that I have learnt a lot of things in the first semester at Stem schools and many good things like: team work and how can I work with and how can deal with my teammates and rearrange my ideas with their ideas and at the we choose the best idea that we see. If you don't how to work in teams you can't deal with life in stem schools and you should share your experiences on your teammates and learn about your mistakes from them and you should be an active member in the group if you want to be team worker. Team work made me learnt from my mistakes and fix them. work in groups has many and a lot of advantages such as it is save a lot of time because if one person take the task he will take a lot of time to do it in searching, writing and remember the information about it but in teams more than one work in the same task and it saves a lot of time to any. Team work taught me how to achieve works in less time because there is a timer warned you about the specific time for the task and if I didn't make the task in the specific time I will be in trouble. Another good thing that I have learnt is how to use the latest technology and how use laptops in scientific search and studying the scientific subjects.

Q2:

Our capstone project in this semester is about the wasted energy and how to recover it or how can we benefit from it in our life. energy is important in our life? Yes very important because it manage all things in our life like cars, factories and everything in our life should have energy to work. So what does it mean? Wasted energy it is means that the wasted energy that we didn't use for anything or we didn't benefit from it at all sides. The electric energy is a perfect kind of wasted energy that we lose it in a lot of kinds and we didn't take our care about it and we should deal with it because it is very important in our life and everything should have electric energy to work. We should deal with it because if we let it in waste after long time we will see that the all cars and factories and all buildings won't work because it can't find any energy to work after a lot of time in losing the energy without thinking. So we have this semester to search and make a scientific idea that should have a big quality in saving energy and with low cost. So will work hard this semester to find and idea that will beat the grand challenge of wasted energy.

Q3:

I think that physics is very important for our capstone project this year because it has a lot of and many concepts that are very related to our capstone project and a lot of concepts in physics talks about the energy and we have to learn about it in many different ways because it will help us a lot in our capstone project for this semester. The rocket engine is very powerful technological application of fluids. There are a lot of forms for input and output energy that will make the rocket engine work. We can put input energy like gas and when it will work it will kicked out in picture of smoke and fire. It will give us a heat energy from the fire that get out from fire the gas that we have put it in the input energy and we can change this heat energy to many types of energy like electric energy, thermoelectric energy and many other types of energy. How can it help us in our capstone project for this semester? It teaches us a kind of the many kinds of the wasted energy in our life and we in this capstone should recover the wasted energy that we didn't use from any device that give us energy and we didn't use it.

Q1:

Team work is very essential for any team because team work make the tasks faster and with high quality, and if any one works individually at any team he will face big problems and he will face many troubles and after that he also won't do the work without his team so the communication between the members is very important because if there isn't communication between the members in the group the group won't do anything. Our capstone group for this semester is four members and we know the advantages of the teamwork because we worked in the capstone for the last semester and we know how communicate with ourselves We planned for this in many ways like, we made a chat between us and any make a research or knew anything new an=bout the project he sent it for the chat and we discuss it, everyone in the group has the others phone number because when we in the holidays we should with ourselves to discuss the new news about the project and what they search about. Our group is very good because everyone in the group deals with the other members as they his brothers and everyone know what should he do because we divide the work step by step, that means everyone finished his task he take a new one and he have to do this task.

Q2:

For this semester our project is about the wasted energy at any process and how can benefit from this wasted energy so we have to make a lot of research to identify a solution for this problem so what are the sites we searched and why choose it?

First when we make a research we didn't search in one site but depends on searching in many sites and we collect the information that we need from all sites. The most site we search in when we make a research is Wikipedia because this site a lot of information for anything we need to search on and it has a lot of information at all fields. We said our idea to our capstone teacher, so he gave us a Pdf file that contains some information that takes about how to compress batteries to take the energy from it because our idea is talks about making compress batteries to take the energy from it because the energy that we use from the battery is only 20% of its energy, and after we use this percentage of energy the battery stopped working and we can't use or benefit from the other 80%. So we took the file from the teacher and now we are reading what it contains, we also used some videos from youtube that helped us to identify the idea.

Q3:

Because we are in stem, so we should benefit from any second in our life, so our project this semester is about the wasted energy and how we can benefit from it in our daily life, what is the most kind of energy we waste and how it had been wasted and how can we solve this big problem? There are many kinds of wasted energy that waste every day and we didn't take our care for this, the electric energy is the most kind of wasted energy because every house has electricity and we waste it with a huge amounts and we benefit from it with a little ratio, we waste electricity when we let the lights turned on when we are sleeping at night because it take a high amount of electricity and didn't need it, let the TVs and computers turned on when we didn't need it and other many ways of wasting energy. Factories and companies also take a huge amount of electricity and most of these electricity goes away and we didn't benefit from it because they let the lights on all the day and they didn't turn off the lights anytime. It isn't wasting energy only but when you let the lights or TVs or computer or any electronic devices

because any electronic device had hours for work, after these hours finish the device stop working and we should buy a new one so it is also wasting for money not only wasting energy.

1. In the first semester, we faced a lot of challenges which allowed us to earn more experience as in the first semester we didn't have any ideas about writing a portfolio, poster or even making a prototype. As a result of that we were making most of our work wrongly but thanks to our capstone teacher who guide and helped out us. In semester we are trying to avoid what happened in the first one so we don't do anything without discussing it with each other. We are working and doing our best, trying not to waste any single moment as the first semester taught us the importance of time. First semester experience taught us a lot for example I remember very well that in my old team we were late in the portfolio so, we had to work morning and evening we really learnt from mistakes like that. so, that we are trying to do our best, we also learnt how to communicate with each other as in the first semester we didn't know how to communicate with different people from different places but now we can discuss in a smoother way even if the team's members are different they all were in a group in which all of us learnt how to communicate with different people. We also gain a lot of creativity from the first term as it became more comfortable to us to think about our capstone challenge this year. Yes, it is a bit different but we can do it. We learnt from stem school how to trust each other and that we can't work with each other without trust. To my mind, the first semester had a very big change to all of us in working and in our sociable life.
2. Making sure that the energy topics researched are scientifically based is very important. so, we make sure that the websites that face us are from the (.org), (.edu) or even from the (.gov). these three website are trusted as scientists and doctors write in them not a regular person who doesn't have a lot of experience. We search about a single thing several times till we have the required which we need in addition to making sure that the website we find is trusted or not. At the time of finding the required thing we know that this is the suitable topic. We usually start searching questioning for example: when we needed to know more about the alternative energy we searched for (what is meant by alternative energy? / what is the uses of alternative energy?) the

search showed us that it is the same as the renewable so, when we didn't find enough of information we searched for the renewable energy. This was one example from our topics. In addition, if we found anything unclear we go to the capstone teacher to guide us and make us have a point to start from.

3. In this semester we are working on generating electricity using thermal energy through a generator that has specific design requirements. This challenge has an enormous bond to the physics we study nowadays, as by studying it we could measure the pressure of the trapped gas. If a student is using solar energy to heat water vapor. As we studied fluids and studied that the pressure = force / area. We studied in fluid concept the way of measuring the trapped gas and many things else. The way the project will work is that the trapped gas contains water molecules which by increasing it. The molecules will move more quickly pushing each other. This friction between them results in energy which is required for our capstone challenge. In other words, this way with the help of the physics subject all the requirements needed could be achieved.

Journal 1

As this is your 1st journal at your STEM school, what are you most excited to learn about while at your STEM school and why? Blue

As I am in STEM school, I am very excited to learn a lot of subjects and a lot of skills. STEM schools helps us to learn what we love. STEM schools give us the chance to create. One of the most important skill that I want to learn is the teamwork skill. Because it helps us to improve our self. It helps us to be better. For example: when we have a problem, it is better to work in a team because this helps us to solve any problem. We discuss the problem and exchange ideas to solve it. When we disagree on a problem, we vote for the perfect idea and we try to persuade each other with the most perfect idea. In addition, the most subject that I want to learn is physics. Because physics is the whole world. We use physics every day. For example: in motion, in building. Actually it is the most subject that I want to be expert in it. Physics helps us to understand the life around us. It also helps us to explain each phenomena that happen in the universe.

The STEM schools in Egypt help students prepare to become adults who are helping Egypt solve big problems called Egypt's grand challenges. The grand challenge you will work on for your first capstone is to recycle and retain garbage for recycling. Explain one example of how recycling could solve the problem of limited resources of Egypt. Green

As I am in STEM school, I have to think to help my country. Egypt's grand challenges are very important problems that faces Egypt. Recycling materials and wastes is one of the most important things in the world especially in Egypt. Recycling is the process of converting wastes and garbage into new materials that will benefit us to make new things. A lot

of garbage in the house can be recycled. We can have a lot of benefits from garbage. Recycling materials helps us to solve the lack of resources in Egypt. For example: when we recycle old paper that we don't use, we can benefit from it to produce new paper to write and use it again. We also have a problem in the lack of plastic. By using recycling, we can solve this problem by recycling old and used plastic to produce new plastic materials to use it. Recycling also helps us to reduce the amount of energy that we use, as recycling materials helps us to reduce the amount of the used electricity. For example: we use 70% less energy by recycling materials instead of remanufacturing it. Recycling is very useful in improving the economy by using the material more than one time.

Using your best English skills, write a short paragraph explaining the meaning of "Recycling" as if you were writing to a preparatory school student. Blue

In STEM schools, we learn how to solve Egypt's problems. There are 11 grand challenges that faces Egypt. Recycling is one of the most important problems in Egypt. We have a lack of resources in Egypt. By recycling materials we can solve this problem. Recycling is the process of converting old and used materials into new materials that I can benefit from it. Recycling is to use the material more than one time to reduce the amount of the used materials. Many of the generated wastes in the house can be recycled and reused. For example: we can use and recycle the kitchen wastes, the old bottles, the newspapers,etc. when we do this, we can help Egypt to improve and be better as this helps to produce energy and reduce pollution.

Being a student at STEM School requires developing different skills (like English language, Computer skills, group work ...). Mention one skill that you need to develop to be a good student at STEM School, Explain how you would develop it? **Blue**

As I am a student in STEM school, there is a lot of skills that is important to help us to be better. So, STEM schools require developing our skills to achieve our goals. There are a lot of important skills that we should have like: Computer skills, language skills, teamwork skills...etc. For me, the most skill that I want to develop is the teamwork skill. Teamwork is the most important skill to be a successful student in STEM schools. Working as a team help us to work easily. It also helps us to save a lot of time, to do our job with a better way. Developing this skill is very important thing. To develop the teamwork skills, we should follow some steps. For example,

1. We must learn how to speak politely with our friends. This will help us to respect each other in the team and to respect our different ideas.
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3. We should respect our time, not to waste it by fighting and disagreement on the ideas just to show that you have a loud voice.
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Zeyad El Gameel

As you and your team are working on the Grand Challenge of recycle and retain garbage for recycling, you should choose a problem to do your Capstone for this semester. What is the Problem you choose to work on? Explain why it is important to solve this Problem? Blue

There are a lot of problems that faces Egypt and as I am a student in STEM school, I have to think to solve this problems. In our capstone we are working on a big grand challenge which is recycle and retain garbage. There is a lot of garbage in Egypt that pollute the environment and we don't benefit from it but if we recycled this garbage, we will solve a lot of problems. In our capstone, we are making a building block from a recycled materials. This will help us to solve the arid areas, the urban congestion and the recycle and retain of garbage. We chose to work on the arid areas. One of the problems that we are solving is the urban congestion. Our building block will help us to build new cities and new bridges. That will help us to kill the urban congestion problem. Solving this problem is very important for us because it makes a lot of problems for us. For example,

1. It is a main reason of spreading disease.
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So, we must solve this problem by building new cities in the desert.

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Zeyad El Gameel

Zeyad El Gameel

Capstone tasks require team work, each one within the team has a role and all of the team members should exchange roles among each other and improve themselves by the time. What was the best role you did with your team? And what do you need to improve your roles in the future? Blue

As we are students in STEM School, we are asked every semester to work on one of Egypt's grand challenge. We work in groups and we work in a team. We try to solve this problem by working together and think together. Teamwork is the most important skill in our little community. In STEM school we work in group of five members. Each one in the group has his role and his job. Of course all of us are working together but in the same time everyone has a job and a task to do. In my group, I worked in all the positions. I'm now the leader and I must share in the constructing of the prototype. Actually this is the best role I had. I can manage our time and give tasks fairly to my friends. I love to build the prototype and I'm very good at this. In the future, I need to work more on myself in order to be able to work in all the positions in the group without any mistake. I need to improve my writing skills to be a good writer. I need to improve my search skill. All of these skills must be in anyone in the group to be good at all positions.

Zeyad El Gameel

After reviewing prior solutions related to your Capstone Project, you should Identify Design Requirement what is your Design Requirement? Explain how your prototype is addressing it? Blue

In our world, we have a lot of wasted energy that is not used. Wasted energy can be in a lot of forms. It can be heat or wind or even some wasted electricity in some machines. One of the important things in any project is the design requirements. Design requirements helps us to know how to do our prototype and how would it achieve the test. So, our main design requirements this semester are:

- 1- Increase efficiency
- 2- Decrease Cost

In our project the design requirement is to decrease the amount of energy that is used in heating the water by using the wasted heat energy in the bread oven to heat water to be used instead of using the electric heater that uses huge energy and costs a lot of money. So we are decreasing the cost of heating water. A zigzag line of water copper tube will be inside the oven and it will be heat and transfer the heat energy to water and the water will rise to all the flats in the construction and be saved in an isolated container to be used all the day. Our prototype is addressing this by making a small design of oven using small bricks and we put a source of heat inside it and a small water copper tube inside it. We will measure the temperature of water before and after. We will save the water in a small container to use it later.

Zeyad El Gameel

In Earth Science, (ES.1.09) you are learning about - Compare and contrast the different resources used by different countries to meet their energy needs. Explain how would you benefit from this in your capstone work about wasted energy? Blue

As we are students in STEM School, We are asked to work on a challenge every semester in our capstone. In STEM School we are learning a lot of subjects. We learn in these subjects some information that will help us in our Capstone. In every subject there is a connection between it and the capstone. In Earth Science, we are learning about Comparing and contrasting the different resources used by different countries to meet their energy needs. Our world is using a lot of energy every day. Energy is the source of everything. Each country has its own energy resources. Each country try to use all the available resources in it. There are a lot of energy resources in our world. The sun, wind, water,.....etc. Actually this helped us to know all the resources in the world so, we can think and use the wasted energy. We are trying to use all the wasted energy as much as we can. So, people invented solar cells to use the wasted sun light. They invented the wind turbines to use the wasted wind. So, in our capstone this helped us to discover some wasted energy sources. So, we began to think how to use it. We also thought of developing some ways. We are trying to use the available wasted energy in our country to be better.

Zeyad El Gameel

Group Presentation has an important role during capstone Exhibition. What do you suggest having a good group presentation for the next Exhibition? Blue

As we are students in STEM School, we are asked every semester to work on one of Egypt's grand challenges. The most important skill in this school is the teamwork and how to communicate with others. We work in our capstone every semester as a group and we must apply the teamwork skills. Dealing with each other in the group is very important. The most important thing in our capstone exhibition is the harmony between us. Our presentation in the exhibition is the main thing that we are having our degrees on it. So, we must have a perfect group presentation without any mistakes. To achieve this, we should have some practice and some steps.

- We should practice many times on our presentation.
- We should avoid any fight or argument in the exhibition hall.
- The leader of the group must give everyone the best part that he could speak about it.
- We should make a signal between us to organize the show.
- We shouldn't interrupt anyone while he is speaking.

All of these are suggestions to have a perfect group presentation and to avoid any mistakes in our presentation.

Zeyad El Gameel

As our conclusions summarize how your results support or do not support your original hypothesis, which it should be drawn from the prototype test results and analysis, write your Project Conclusion for this semester including your hypothesis and the main results. Blue

We worked this semester on recovering of wasted energy and how to use it in different ways. In my group we decided to work on the bread furnaces as a lot of wasted energy is not use in this system. So, our hypothesis was that we could hang a water copper tube in the shape of zigzag line in the ceiling of the furnace and the heat of the furnace will heat the copper tube and this temperature will transfer to the water inside the tube which is connected to an isolated container on the roof to be used all day instead of the electric heater. According to the results we could heat the water and it reached **65 degrees Celsius** so, our hypothesis was true that copper has a low heat capacity so, it will transfer the temperature very quickly to the water. So, we didn't use the electric heater which uses 4 kilowatts per hour and we could save a lot of money for Egypt. This project is the best solution for many problems in Egypt such as the wasted energy & save the energy of electricity at some houses as the high consumers of electricity is in houses. As this project will save about **31,932,900 L.E per year**

Zeyad El Gameel

In Math, you are learning about “Create, Interpret and Analyze different types of functions that model real-world situations”. Which function did you use for your Capstone Project about energy? And explain why did you use it? Blue

As we are students in STEM School, we are working every semester on one of Egypt’s grand challenges. In STEM Schools, we are learning a lot of subjects and a lot of skills like the teamwork. In every subject we must have a connection between it and the capstone. In Maths we are learning about Create, Interpret and Analyze different types of functions that models the real- world situations. Functions are very important and useful in our capstone. We used a lot of functions that helped us to calculate our results. The function is a type of equation that we must put some variables and the function convert it to a result of another variable. We used the function $P = MC\Delta T / t$ as

- **P** is the power
- **M** is the mass
- **C** is the specific heat of water
- ΔT is the change in temperature
- **t** is the time

We used this function to calculate the amount of energy that the water gained after it is heated in the copper tube.

So, functions are very important in our life. We use a lot of functions every day. We use a lot of function in our project to have our results.

Zeyad El Gameel

J1:

1- This is the third week in this semester, you already covered some capstone sessions, and you already did some activities to help you understand the capstone challenge about energy. Mention one activity you still need to do to better understand this semester's challenge, and explain importance of the activity to you.

2- Suppose that during your current capstone you learn that you have missed some information (or have a misconception about one idea), and you want to search about that topic. What resources would you use? Explain how to be sure that these resources are trusted.

3- Your project in this semester aims to use a process by-product as a source of energy. Explain the concept of a "by-product", and give an example of how you might use it as a source of energy.

J2:

1- This is the second team you have involved with during your STEM life, what was the worst two point that you did in the first semester, and how are you going to overcome one of them through the second semester?

2- "The second step of EDP (engineering design process) is research, including reviewing prior solutions to the problem you are solving. Provide a keyword you might use for your search for prior solutions, and give two reasons why this keyword will help you search for prior solutions."

3- Your challenge this semester is to produce energy, and in Physics (1.08) you are studying pressure differences in fluids. Your team decides to produce energy to light the pass of Mount Saint Catherine, thus you plan for a field trip to the top of the mountain using a hot air balloon. What time of day or night would your team launch your balloon to achieve maximum lift at launch, and why does Physics suggest you choose that time?

J3:

1- Time is precious, and every team has a limited time to finish their capstone. Mention two factors that lead to wasting time, and explain how to overcome them.

2- A prototype must be testable to be approved. Explain how to ensure that your prototype will perform this task successfully.

3- You study the photosynthesis process in Biology (BI.1.10). The waste product of photosynthesis can be used to produce energy in other processes of other organisms. Compare this process of using the waste product of one process as an energy source of another process to the solution you chose for your capstone project.

J4:

1- After studying in your STEM school, a friend asks what Capstones are. Explain what a Capstone is for your friend. Include two benefits you received from Capstones that students in traditional schools missed.

2- In your capstone project you researched topics and prior solutions, and then you developed your solution according to the design requirements and the information you got from testing your prototype. Mention your suggested solution, and then explain how you improved your solution with more information.

3- You studied the using heat sources to generate other forms of energy (PH.1.10). In some industries there is a lot of wasted heat produced by conduction, convection, or radiation. For example, in the process of forging metal, the containers glow with heat. Is this an example of wasted energy conduction, convection, or radiation? Explain your answer.

J5:

1- You participated in the summer camp at the beginning of your first stem academic year. Mention one point that can be added to the next summer camp program and explain why it would be helpful. Mention another point to be dismissed from the program or improved, and explain why it may not be useful.

2- According to Engineering Design Process you and your team are at the stage of constructing and testing your prototype. Explain your steps to construct the prototype and how you modified the prototype based on initial results of your test.

3- "(Ch.1.10) Chemistry laboratory techniques (such as filtration, crystallization, evaporation, etc.) are practical skills that play important role to perform various experiments. Suppose a student team had a capstone project that used waste heat as an input to a chemical process. Describe one laboratory technique you might depend on. Mention two precautions you need to consider for safety."

Journal 1

WORKING IN A TEAM FOR CAPSTONES MAY BE NEW FOR YOU, AND YOU MAY BE USED TO WORKING ALONE. WHAT PART OF WORKING IN A TEAM ARE YOU EXCITED ABOUT? WHY ARE YOU EXCITED ABOUT THAT PART OF TEAMWORK? (BLUE)

As iam a student at stem school, we always work in a team in the capstone

and in the class, we work in a team with each other and distribute the tasks between us, we all used to work alone, but here in stem schools we must work in a team to achieve our goal, we must respect and understand each other, the team contains five students

everyone has work to do. the team leader he distributes the tasks and manage the team, the researcher he is the source of information and he always do a research, the timer he controls the team meetings and make a dead line for everything the writer he writes and document everything with date and time, the presenter that discuss ideas and make presentations, I am excited about learning soft skills like deal with others that have different ideas and different thinking, that make us benefit from each other, and learning the team work, and time management, our capstone helps us to learn very important skills, and iam very excited to learn all these skills, that will help me in my live. IT IS IMPORTANT TO CHOOSE TRUSTED SOURCE OF INFORMATION FOR YOUR CAPSTONE PROJECT.

YOUR FRIEND THINKS OF USING AN INFORMATION SOURCE SUCH AS A FACEBOOK FOR THEIR SCIENTIFIC INFORMATION. DO YOU THINK THIS IS A TRUSTED SOURCE FOR SCIENTIFIC INFORMATION? WHY OR WHY NOT? (BLUE)

As iam a student in stem school, I always must make a research about information in the internet or in references or books or other resources , I have to make my research and take my information from trusted sources in the internet like(.org)(.Edu),in one of the steps of the engineering design process(Edp) the(research) we make a lot of research ,like search about solutions that already tried in the problem of rain water collecting , we make a research about solution that already tried to collect rain water and benefit from it , we search in trusted sources only . I must not

make a research in un trusted sources like(.com)and other web sites that don't have trusted information and may be wrong ,if my friend thinks of using Source of information such as face book that is untrusted I will ask him not to do this , because it's very wrong to take information from untrusted site and may have wrong information because any one can share information in the face book ,if these information is wrong that will harm us if we used it in our capstone , as we must make a research in trusted sources. that have scientific information that will help us in our studying or in our capstone.

(CH.1.01) IN CHEMISTRY, YOU LEARNED THAT VARIABLES CAN BE RELATED TO EACH OTHER IN DIFFERENT WAYS. SOMETIMES VARIABLES MOVE IN THE SAME DIRECTION, AND SOMETIMES IN OPPOSITE DIRECTIONS. FOR EXAMPLE, THE TIME IT TAKES TO GET HOME IS USUALLY SMALLER IF THE SPEED OF YOUR CAR IS BIGGER. WHAT ARE THE TWO VARIABLES YOU COULD USE IN YOUR RAINWATER COLLECTION PROJECT? AS THE FIRST VARIABLE CHANGES, HOW DO YOU THINK THE OTHER ONE WILL CHANGE? (Green)

Chemistry is very important subject, we use it in our capstone, we studied in chemistry two types of variables one is the independent variable and the other is the dependent variable, the independent variable is the variable that does not change if the other variable changes, but the dependent variable changes if the independent variable change, in my rain water collection project there is two variables, one of them change when the other change (dependent variable), the two variables is the time and the water that we collected , the time is the independent variable, and the quantity of water is the dependent variable, as the amount of the water that we collected increases when the time increases, the time always increases and doesn't depend in the other variable (the water), but water amount depends on the time. as when the time increases the quantity of water increases.

Journal 2

HOW ARE YOU AND YOUR TEAM COMMUNICATING WHILE WORKING REMOTELY? ALSO, HOW CAN YOUR TEAM IMPROVE THEIR EFFECTIVENESS WHILE WORKING REMOTELY? (Green)

As I am in stem school, I have to work in a team in the class and in the capstone, we have to work with each other to achieve our aim, this year we sometimes take our sessions online because of the covid-19 ,we have to stay home, we communicate with each other and do our tasks for the capstone ,we communicate through the internet ,that make us communicate easily ,we distribute our tasks, and manage our time, we make meetings to discuss what will we do and distribute our tasks, we communicate remotely easily, my team improve their effectiveness and make the tasks that we distribute in a good way, we work hardly with each other and understand each other, we have to respect each other in the team, to do a good work , we decided to manage our time when we communicate remotely, everyone in the team improve his effectiveness, everyone in the team have special skills that make him special from the other, the communication between the team is very important ,so we always communicate with each other in different ways ,we always communicate and talk with each other to decide the tasks that we will do for the capstone .

WHAT ARE THE SAFETY RISKS FOR BUILDING YOUR PROTOTYPE? WHAT STEPS WILL YOU TAKE TO LOWER THOSE SAFETY RISKS? (blue)

In stem school we work in groups in our capstone, this semester we must solve the problem of population growth in Egypt, the population growth has bad effects, because of the population growth, we need to collect the rain water to use it instead of wasting it, as in Egypt the number of people increase every year , we make a prototype to collect rain water and solve this problem , in our prototype we will avoid the safety risks that may harm our prototype , one of this safety risks is the strength of the prototype, we have to make our prototype strong to collect rain water without damage or break it , we will make steps to lower this safety risk, we will make our prototype strong by make the sticks very strong, the sticks is the main building unit and the most important thing in our prototype , we will make the sticks strong by the glue ,we will use a good type of glue that will make our prototype strong enough to collect water without damage it ,other risk that we might face if sticks absorb the water ,we will make steps to lower this risk by using a good water proof that make layer between the sticks and the water to prevent that sticks absorb water and the water come out from the prototype and this might cause the damage of our prototype ,it will be problem if the prototype damage so we will be sure that all the sticks is strong enough and join to each other with the glue , then we will add a good layer of water proof and be sure that the water proof layer is good enough ,to prevent water come out the sticks. We will choose a good type of water proof.

(MA.1.02) IN MATH YOU HAVE BEEN STUDYING THE VALUE OF SIMPLE STATISTICS. USING AT LEAST ONE CONCEPT FROM STATISTICS, HOW WILL TESTING YOUR PROTOTYPE MULTIPLE TIMES AFFECT THE ACCURACY OF YOUR DATA? (Green)

Math is very important subject, that helps us in document the results of the tests that we made to test our prototype, in lo2 we studied the dot plot graph, we can use dot plot graph to document our results, the dot plot graph is very simple and easy graph that will help us to document the results clearly and in a simple way, this type of graph is the most type that will help us in our capstone as it the most simple and easy graph, we studied how will the multiple times of the prototype testing affect the accuracy, if the number of tests increases the accuracy will increase too, for example if everyone in our team test the prototype for one time the results might be not accuracy . if every one test the prototype two or three times the accuracy will increase, that mean that the results will become more near to the real value, we will test our prototype multiple times to be sure that the value is accurate.

ARE YOU THE TYPE OF PERSON WHO LIKES TO COMPLETE YOUR WORK IN A SHORT AMOUNT OF TIME NEAR THE DEADLINE, OR DO YOU LIKE TO DISTRIBUTE YOUR WORK INTO TASKS OVER TIME? EXPLAIN.

in stem schools, we have a capstone project every semester, we work in groups for the

capstone, in my team we collaborate and distribute our tasks. then we do our tasks before the dead line. we must work hard to achieve our aim. after we distribute the work we begin to work hard, I like to distribute my work into tasks over time. I start to do my work early before the dead line. I like to do my work hardly and in a perfect way. I make my work before the dead line and make it in a good way, I like to work hard and early to enough time before the dead line. so, in our team we work before the dead line with enough time to end our work. After we end our work we make a revision on it .and think if it is good enough. every one revises the other task and then we think together if we need to change something on it. I like work in team. that make me learn skills from my team mates like the time management. I learned to do my work in the time.

TESTING YOUR PROTOTYPE CAN LEAD TO ONE OF TWO CONCLUSIONS. ONE CONCLUSION IS THAT YOU WANT TO MAKE ONLY SMALL CHANGES TO YOUR PROTOTYPE. ANOTHER CONCLUSION IS THAT

YOU WANT TO CHANGE YOUR ENTIRE DESIGN. BOTH CONCLUSIONS ARE OKAY IN CAPSTONE PROJECTS. DESCRIBE WHICH CONCLUSION YOUR TEAM EXPERIENCED.;

In stem school we work in groups for the capstone challenge. In my team after we made the test plan we decided to change

our design. to a design that meet the design requirements in a better way. First we decided to make our design like a funnel, the design was a big circle that connected to a small circle and connected to a small circle the sides that connect between them have

a slope to make water move quickly to the bottom, after the test plan we decided to change our design we change the circles into triangles, that because sides that connect the two triangles make a bigger slope that will increase the velocity of water collection,

this design will help us to collect more water in less time. The second design helped us to collect more amount of water than the first design. The first design collect water with velocity of 1m/s .the second design collect water with velocity of 3m/s. the

second design is better more than the first design. And meet the design requirements .so we change our design to this design

(ES.1.03) IN EARTH SCIENCE YOU HAVE BEEN STUDYING BUILDING MATERIALS. WHEN YOU CREATE YOUR POSTER, YOU WILL GIVE RECOMMENDATIONS FOR BUILDING A REAL RAINFALL COLLECTION SYSTEM. YOUR FRIEND SUGGESTS THAT YOU USE AN ALLOY INSTEAD OF A BARE METAL FOR YOUR COLLECTION CONTAINER. DO YOU AGREE WITH HIS RECOMMENDATION? WHY OR WHY NOT?

In stem school we have a capstone challenge, our capstone helps to solve one of the problems that faces Egypt. this semester our capstone challenge is to collect rain fall water. Instead of wasting it. we must

collect rain water to solve the problem of water scarcity. If our rain water collection system applied. I think it is better to use an alloy instead of bare metal. that because the alloy has different types of metals in it so it become more stronger than the bare metal. that make it has more water resistance. That give the design more efficiency. The design must be strong to collect water without damage it. in our design the sticks will change to alloy, the glue that used to make them stick together will change with another material like cement. the water proof we used is the varnish. We can use varnish or plastic substance to make a water proof layer to prevent the water leakage from the rain water collector system.

Old Journals

GRADE 10

1- As this is your 1st journal at your STEM school, what are you most excited to learn about while at your STEM school and why?

As I am in STEM school, I am very excited to learn a lot of subjects and a lot of skills. STEM schools help us to learn what we love. STEM schools give us the chance to create. One of the most important skill that I want to learn is the teamwork skill. Because it helps us to improve our self. It helps us to be better. For example: when we have a problem, it is better to work in a team because this helps us to solve any problem. We discuss the problem and exchange ideas to solve it. When we disagree on a problem, we vote for the perfect idea and we try to persuade each other with the most perfect idea. In addition, the most subject that I want to learn is physics. Because physics is the whole world. We use physics every day. For example: in motion, in building. Actually, it is the most subject that I want to be expert in it. Physics helps us to understand the life around us. It also helps us to explain each phenomenon that happen in the universe.

BLUE

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2- The STEM schools in Egypt help students prepare to become adults who are helping Egypt solve big problems called Egypt's grand challenges. The grand challenge you will work on for your first capstone is to recycle and retain garbage for recycling. Explain one example of how recycling could solve the problem of limited resources of Egypt.

As I am in STEM school, I have to think to help my country. Egypt's grand challenges are very important problems that faces Egypt. Recycling materials and wastes is one of the most important things in the world especially in Egypt. Recycling is the process of converting wastes and garbage into new materials that will benefit us to make new things. A lot of garbage in the house can be recycled. We can have a lot of benefits from garbage. Recycling materials helps us to solve the lack of resources in Egypt. For example: when we recycle old paper that we don't use, we can benefit from it to produce new paper to write and use it again. We also have a problem in the lack of plastic. By using recycling, we can solve this problem by recycling old and used plastic to produce new plastic materials to use it.

Recycling also helps us to reduce the amount of energy that we use, as recycling materials helps us to reduce the amount of the used electricity. For example: we use 70% less energy by recycling materials instead of remanufacturing it. Recycling is very useful in improving the economy by using the material more than one time.

GREEN

3- Using your best English skills, write a short paragraph explaining the meaning of "Recycling" as if you were writing to a preparatory school student.

In STEM schools, we learn how to solve Egypt's problems. There are 11 grand challenges that faces Egypt. Recycling is one of the most important problems in Egypt. We have a lack of resources in Egypt. By recycling materials, we can solve this problem. Recycling is the process of converting old and used materials into new materials that I can benefit from it. Recycling is to use the material more than one time to reduce the amount of the used materials. Many of the generated wastes in the house can be recycled and reused. For example: we can use and recycle the kitchen wastes, the old bottles, the newspapers, etc. when we do this, we can help Egypt to improve and be better as this helps to produce energy and reduce pollution.

BLUE

1- Being a student at STEM School requires developing different skills (like English language, Computer skills, group work ...). Mention one skill that you need to develop to be a good student at STEM School, Explain how you would develop it?

As I am a student in STEM school, there is a lot of skills that is important to help us to be better. So, STEM schools require developing our skills to achieve our goals. There are a lot of important skills that we should have like: Computer skills, language skills, teamwork skills...etc. For me, the most skill that I want to develop is the teamwork skill. Teamwork is the most important skill to be a successful student in STEM schools. Working as a team help us to work easily. It also helps us to save a lot of time, to do our job with a better way. Developing this skill is very

important thing. To develop the teamwork skills, we should follow some steps. For example,

1. We must learn how to speak politely with our friends. This will help us to respect each other in the team and to respect our different ideas.
2. We should learn how to persuade each other.
3. We should respect our time, not to waste it by fighting and disagreement on the ideas just to show that you have a loud voice.
4. Finally, we should learn that the success of the team means the success of all the members. So, everyone in the team must work hard to make the team successful not on making only himself successful.

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2- As you and your team are working on the Grand Challenge of recycle and retain garbage for recycling, you should choose a problem to do your Capstone for this semester. What is the Problem you choose to work on? Explain why it is important to solve this Problem?

There are a lot of problems that faces Egypt and as I am a student in STEM school, I have to think to solve this problem. In our capstone we are working on a big grand challenge which is recycle and retain garbage. There is a lot of garbage in Egypt that pollute the environment and we don't benefit from it but if we recycled this garbage, we will solve a lot of problems. In our capstone, we are making a building block from a recycled material. This will help us to solve the arid areas, the urban congestion and the recycle and retain of garbage. We chose to work on the arid areas. One of the problems that we are solving is the urban congestion. Our building block will help us to build new cities and new bridges. That will help us to kill the urban congestion problem. Solving this problem is very important for us because it makes a lot of problems for us. For example, 1. It is a main reason of spreading disease. 2. It causes pollution to the environment. 3. It cause a global warming. So, we must solve this problem by building new cities in the desert.

BLUE

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3- In Chemistry you have learned about Scientific method. Explain how would you use it in your Capstone about recycling materials?

In Chemistry we have learned about Scientific method. Scientific method is one of the most important methods to achieve our goal. This learning outcome helps us to use the scientific method the science reasoning in solving problems. In our capstone we used the scientific method as we first make an observation to the problem. Second, we make some hypothesis to solve the problem. We made some solutions to solve it. Third, we will make some experiments to the solutions. An experiment is carried out to test a hypothesis. This involves gathering new information that enables us to decide whether the hypothesis is true or false, whether it is supported by the new information learned from the experiment. Experiments always produce new observations, and this brings the process back to the beginning again.

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1- Capstone requires teamwork, each member in the team has a role. What is your role in your Capstone group? Why did you choose this role?

As I am a student in STEM school I must work in a team. Teamwork is very useful. Working in a team helps us to be better. It helps us to save our time. Being a part of a team is very interesting. Everyone in the team have a role. This role is decided on his skills. In my team, I am the leader of the team. This is my own role. We decided that I will be the leader of the group. Because I have the skills to this. I can arrange my time well. My team trust me. They put me in this role because they trust that I will help them to achieve our goal. As a result of this role, I have to be hard worker. I must arrange our time. Arrange the time of our meetings. I must be honest between them. I distribute the missions between us fairly. I'm trying to be as they want and as they expect from me. I wish to lead them to achieve our aim.

BLUE

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2- As you and your team are working on the Grand Challenge of recycle and retain garbage for recycling, and you are working according to some design requirements. Mention one design requirement that you are going to work on this semester, explain how will you test your Prototype for it?

In STEM school, we make a capstone every semester. In this semester we are solving the problem of arid areas and the problem of recycling. We are making a building block to solve these problems. We have a certain design requirement to follow. We must follow these design requirements to make a successful project. Our main design requirement is to make a block with recycled materials. The main component of our block must be a recycled material. We are allowed to use one commercial material and we are not allowed to use any electronic materials. The block must be 30cm length, 10cm width and 2cm thick. The problem here is the thickness of the block. One of the design requirements that the block must be light and very hard to put a big load on it. So, we must make a test plan to test how much will the block load. We have two types of test, dry test and wet test. In the dry test we will hang up a load in the middle of the block to measure the pending of the block until it breaks down. In the wet test we will put five blocks in the water and make the same test on a one every two hours. Then we will make a ratio between the weight of the block and the maximum load it carried. This will be the score that the block achieved.

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3- In physics you have studied about the system of forces, the equilibrium system and newton's third law. Explain how would you use ONE of these concepts in your capstone about building block?

Physics is the most important science in the world. We use physics in everything in our daily life. We use physics in walking, running even in swimming. One of the most important laws in physics is Newton's laws of motion. We use Newton's laws of motion in anything. The motion of the cars, trains and planes. We use these laws even in building. We use Newton's laws of motion is test the building blocks. We use especially Newton's third law. Newton's third law that states on "Every action has an equal reaction". We use the Newton's third law of motion to help us to test our block. We have to test how much the block will carry a load. So, we will hang up a weight in the middle of the block and observe the reaction of the block. When we apply a force on the block, the block is affected by this force and a reaction force is exerted. The reaction of the block will help us to know how much the block will carry. We will use the third law of motion to make sure that block is good to use.

BLUE

1- Capstone tasks require team work, each one within the team has a role and all of the team members should exchange roles among each other and improve themselves by the time. What was the best role you did with your team? And what do you need to improve your roles in the future?

As we are students in STEM School, we are asked every semester to work on one of Egypt's grand challenge. We work in groups and we work in a team. We try to solve this problem by working together and think together. Teamwork is the most important skill in our little community. In STEM school we work in group of five members. Each one in the group has his role and his job. Of course, all of us are working together but in the same time everyone has a job and a task to do. In my group, I worked in all the positions. I'm now the leader and I must share in the constructing of the prototype. Actually, this is the best role I had. I can manage our time and give tasks fairly to my friends. I love to build the prototype and I'm very good at this. In the future, I need to work more on myself in order to be able to work in all the positions in the group without any mistake. I need to improve my writing skills to be a good writer. I need to improve my search skill. All of these skills must be in anyone in the group to be good at all positions.

BLUE

2- After reviewing prior solutions related to your Capstone Project, you should Identify Design Requirement what is your Design Requirement? Explain how your prototype is addressing it?

In our world, we have a lot of wasted energy that is not used. Wasted energy can be in a lot of forms. It can be heat or wind or even some wasted electricity in some machines. One of the important things in any project is the design requirements. Design requirements helps us to know how to do our prototype and how would it achieve the test. So, our main design requirements this semester are:

- 1- Increase efficiency
- 3- Decrease Cost

In our project the design requirement is to decrease the amount of energy that is used in heating the water by using the wasted heat energy in the bread oven to heat water to be used instead of using the electric heater that uses huge energy and costs a lot of money. So, we are decreasing the cost of heating water. A zigzag line of water copper tube will be inside the oven and it will be heat and transfer the heat energy to water and the water will rise to all the flats in the construction and be saved in an isolated container to be used all the day. Our prototype is addressing this by making a small design of oven using small bricks and we put a source of heat inside it and a small water copper tube inside it. We will measure the temperature of water before and after. We will save the water in a small container to use it later.

BLUE

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3-In Earth Science, (ES.1.09) you are learning about - Compare and contrast the different resources used by different countries to meet their energy needs. Explain how would you benefit from this in your capstone work about wasted energy?

As we are students in STEM School, we are asked to work on a challenge every semester in our capstone. In STEM School we are learning a lot of subjects. We learn in these subjects some information that will help us in our Capstone. In every subject there is a connection between it and the capstone. In Earth Science, we are learning about Comparing and contrasting the different resources used by different countries to meet their energy needs. Our world is using a lot of energy every day. Energy is the source of everything. Each country has its own energy resources. Each country tries to use all the available resources in it. There are a lot of energy resources in our world. The sun, wind, water, etc. Actually, this helped us to know all the resources in the world so, we can think and use the wasted energy. We are trying to use all the wasted energy as much as we can. So, people invented solar cells to use the wasted sun light. They invented the wind turbines to use the wasted wind. So, in our capstone this helped us to discover some wasted energy sources. So, we began to think how to use it. We also thought of developing some ways. We are trying to use the available wasted energy in our country to be better.

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**1- Group Presentation has an important role during capstone Exhibition.
What do you suggest having a good group presentation for the next
Exhibition?**

As we are students in STEM School, we are asked every semester to work on one of Egypt's grand challenges. The most important skill in this school is the teamwork and how to communicate with others. We work in our capstone every semester as a group and we must apply the teamwork skills. Dealing with each other in the group is very important. The most important thing in our capstone exhibition is the harmony between us. Our presentation in the exhibition is the main thing that we are having our degrees on it. So, we must have a perfect group presentation without any mistakes. To achieve this, we should have some practice and some steps.

- We should practice many times on our presentation.
- We should avoid any fight or argument in the exhibition hall.
- The leader of the group must give everyone the best part that he could speak about it.
- We should make a signal between us to organize the show.
- We shouldn't interrupt anyone while he is speaking.

All of these are suggestions to have a perfect group presentation and to avoid any mistakes in our presentation.

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2-As our conclusions summarize how your results support or do not support your original hypothesis, which it should be drawn from the prototype test results and analysis, write your Project Conclusion for this semester including your hypothesis and the main results?

We worked this semester on recovering of wasted energy and how to use it in different ways. In my group we decided to work on the bread furnaces as a lot of wasted energy is not use in this system. So, our hypothesis was that we could hang a water copper tube in the shape of zigzag line in the ceiling of the furnace and the heat of the furnace will heat the copper tube and this temperature will transfer to the

water inside the tube which is connected to an isolated container on the roof to be used all day instead of the electric heater. According to the results we could heat the water and it reached 65 degrees Celsius so, our hypothesis was true that copper has a low heat capacity so, it will transfer the temperature very quickly to the water. So, we didn't use the electric heater which uses 4 kilowatts per hour and we could save a lot of money for Egypt. This project is the best solution for many problems in Egypt such as the wasted energy & save the energy of electricity at some houses as the high consumers of electricity is in houses. As this project will save about 31,932,900 L.E per year.

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3-In Math, you are learning about “Create, Interpret and Analyze different types of functions that model real-world situations”. Which function did you use for your Capstone Project about energy? And explain why did you use it?

As we are students in STEM School, we are working every semester on one of Egypt's grand challenges. In STEM Schools, we are learning a lot of subjects and a lot of skills like the teamwork. In every subject we must have a connection between it and the capstone. In Math's we are learning about Create, Interpret and Analyze different types of functions that models the real- world situations. Functions are very important and useful in our capstone. We used a lot of functions that helped us to calculate our results. The function is a type of equation that we must put some variables and the function convert it to a result of another variable. We used the function $P = MC\Delta T / t$ as • P is the power • M is the mass • C is the specific heat of water • ΔT is the change in temperature • t is the time We used this function to calculate the amount of energy that the water gained after it is heated in the copper tube. So, functions are very important in our life. We use a lot of functions every day. We use a lot of function in our project to have our results

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GRADE 11

1-Capstone work includes a lot of theoretical information and practical skills to be learned. Give one example of a piece of information and one skill you have learned during your previous Capstone about “Water”. Explain why your newly-gained information and skills were important for you?

STEM schools is the best education in Egypt. We learning many things and get a lot of skills. And the best thing in these schools is the capstone. And capstone means team work and team collaboration. In our capstone we are trying to solve the challenges that faces Egypt and find a solution for it, so we need to work with each other as a team. Capstone work includes a lot of theoretical information and practical skills to be learned. For our last semester our capstone was about the problem of water. And searched more about this problem and got many information which we had not known before. We found that there are many problems related to this problem: recycling of water, water pollution, treatment of water, and water in agriculture. This is an example about the theoretical information. Capstone make us research more so we got a lot of information like how can us treat our waste water using just some sand, gravels, and cotton. The capstone also gives us a lot of skills that helps us in all of our life fields. We have roles in our team so it makes me follow the roles and make my personality stronger. In our capstone we work with many different people which mean more different personalities and characteristics and I have to deal with that and learn how to work with the all and accept the others opinions. I learned how to make and manage a discussion and it make me trust in myself more than before. And these things helped me more and helping me: at home and work, to deal with all things which I face it.

2-“Nature is the best teacher for us”. Do you agree OR disagree with this? Explain why? Support your answer with an example: -

When you sit with yourself and thinking, what the things you think about? For myself the most things which I thinking about is related to the nature. I make my own world which all things on it is nature even the people. Try to thinking and as a critical thinking to know the secrets of the nature and try to improve it in our daily life. And this is our challenge for this semester. Is to improve the nature in the industry (biomimicry). “Nature is the best teacher for us” this words is true and I agree with it, because many things. All of our life is nature. There are many industrial processes and products that taken from a natural processes like: Dolphin, it is use its own language to connect with the other dolphins under water by using its throats to produce sound and receive it through a member in its head. Dolphins use sound to detect alien objects and predators in their surrounding area and protect themselves. This dolphin property was inspired by underwater sensors to detect objects by sending ultrasound. It is also used to detect earthquakes and tsunamis. The same thing in the bat. And also we used this process to make the sonar. Also, the fastest train in the world at speeds of up to 200 miles per hour, it shape was taken inspiration from the shape of a bird’s beak to make it more aerodynamic. The resulting design was based on the narrow profile of a kingfisher’s beak, resulting in a quieter train that also consumes 15% less electricity and goes 10% faster than before.

3-In English, you are learning about how to “write appropriate materials for a particular writing task”. Write a message to your younger brother to explain the capstone challenge of this semester

at our school we learned about many subjects that help us in our capstone project like English. In English class we learned “write appropriate materials for a particular writing task” and we should tell our younger brothers about our challenge. Our capstone challenge is about the industry and nature. Nature has many solutions that can inform and inspire new approaches to problems associated with many fields of industry (Energy, Agriculture, Manufacturing, Transportation, Construction, etc.). The use of designs in nature to inform or inspire solutions to design challenges is called bio mimicry. All industrial processes have almost the same phases (Input, Processing, output, as well as byproducts and waste). Using nature to inspire new solutions can impact all of these phases. Our challenge is to examine nature’s designs that can inspire solutions to Egypt’s challenges to improve industrial or agricultural processes. Our team will identify an approach that

is based on nature (bio mimicry). This approach should focus on improving the efficiency and cost of that industrial process in a way that can be tested or demonstrated. Your team will research designs in nature that may be related to deal with improving the process itself, shape or design of machinery associated with that process, recycling to deal with waste or by byproducts to reduce the environmental impacts, and any essential modification that may lead to efficiency and cost improvement.

4-In Chemistry, you are learning about chemical processes as an “Introduction to Industrial Chemistry”. Choose one of these Processes. Explain it, give an example of how it occurs in nature

At our school we learned about many subjects that help us in our capstone project like chemistry. We learned about the Oxidation and reduction reaction is a type of chemical reaction that involves a transfer of electrons, hydrogen atoms or oxygen atoms between two species. We can use some of these reactions and electrolysis. an electrochemical process in which current is passed between two electrodes through an ionized solution (electrolyte). It deposits positive ions on the negative electrode (cathode) and negative ions on the positive electrode. it depends on the oxidation-reduction reactions. in some industrial processes such as: 1- extraction of metals. (For example: Fe_2O_3 is reduced to iron using coke $\text{Fe}_2\text{O}_3 (\text{s}) + 3\text{C}(\text{s}) \rightarrow 2\text{Fe} (\text{s}) + 3\text{CO} (\text{g})$ “In addition to other metals such as lithium, sodium, potassium, magnesium, calcium). 2 - Electrochemical cells or batteries. (Like in the storage cells and the oxidation-reduction reaction of hydrogen and oxygen - which are electrochemical cells using oxygen and hydrogen electrodes- in fuel cells to obtain electrical energy). And the processes of photosynthesis. It contain an oxidation-reduction reaction: $\text{CO}_2 + \text{H}_2\text{O} + \text{sun light}$ will produce $\text{O}_2 + \text{glucose}$. And we can use it to convert the CO_2 to O_2 in the industry.

GRADE 12

Capstone Journal #1

What is most challenging or most confusing for you about your first semester Capstone? What will you do differently this semester to deal with or overcome these challenges and confusions?

State the Capstone Challenge in your own words clearly and objectively. (2) Justify why this Capstone Challenge is important to solve. In your justification, include (a) identifying those affected by this challenge, and (b) identifying credible sources that think this is important. *

Capstone Journal #2

The capstone process requires teamwork. As you are working in a group, what is your individual role this semester? Did it change from semester one? Why? Explain the importance of this role. *

What problem did you and your team choose to work on for your capstone project this semester? Explain why is it important to solve this problem

Capstone Journal #3

The capstone process requires teamwork. In your opinion, what are Pros & Cons (advantages & disadvantages) of the teamwork? *

What design requirement/s did you and your team chooses to work on for your capstone project this semester? Explain why you chose them. *

Capstone Journal #4

Engineering Design Process has many parts: 1) Present and Justify a Problem and Design Requirements 2) Generate and Defend a Solution 3) Construct and Test a Prototype 4) Evaluate, Reflect, and Recommend (a) Which part of EDP was the most difficult for your team? (b) Explain how you can have better success with that part next time. *

You are now finishing your 4th Capstone. Select a Capstone project you found most interesting and describe (a) the Challenge, (b) your solution, and (c) your recommendation for future work. (d) Explain how you would turn that recommendation for future work into a new project if you were given the chance in University. *

Capstone Journal #5

Partnerships are critical to success. How did your external expert or experts help your team succeed? Provide specific examples. Your external experts may be a teacher in your school, a university, a business or someone else that is not part of your school. *

If you had a chance to mentor a Grade 1 team, what advice would you give them to develop a successful prototype TEST PLAN using one of your own capstone projects as an example? Be sure to describe your own example. *

2016

اسئلة 2016 كانت عبارة عن اربع اسئلة في 6 امتحانات

Capstone Journal #1

Think about the last capstones you had been working on and how you might improve your performance. What advice would you give to Grade 10 students to help them perform well on their first Capstone?

Choose one of Egypt's Grand Challenges. How is it connected to the Capstone big idea of communication? What are the consequences of not changing our approach to the problems addressed by this challenge? Include (1) economic, (2) environmental and (3) social impacts.

In your biology class you are learning about the structure and function of the nervous system and its role in communication. Explain how can you benefit from this Topic in building your capstone project about communications in terms of Structure and Function.

In Chemistry you are learning about Scientific Reports, choose one research paper you already have about your Capstone, Describe its methodology, analysis, findings, and conclusion. Explain why it can (or cannot) be considered as a Scientific Report.

Capstone Journal #2

The capstone process requires team work. As you are working in a group, what are the criteria for effective team work?

Science is cumulative; new scientific work depends on previous scientific work. You should search for prior solutions related to your capstone project to be sure that you are incorporating prior work. Choose one of the prior solutions related to your project and describe it. What information from the prior solution is helping you with your solution design.

In Physics you are learning about optics. Explain how this topic can be related to your capstone project about communication.

In Chemistry you are learning about uncertainty of measurement. Choose one measuring instrument that you are going to use in your capstone project about communication, and explain how you are going to overcome the uncertainty of its measurements.

Capstone Journal #3

The capstone process requires team work. You already joined about five teams through your experience at STEM school, Explain how your experience in a team working throughout the last two years will affect your work on this capstone.

Designing a prototype and building it is one step of the EDP. Describe your capstone prototype and Explain What makes your prototype a TESTABLE prototype?

Communication is the exchanging of information, Explain how light can be used for communicating information.

In chemistry you have learned about experimental design and analytical methodology, using these information Explain your test plan for your capstone prototype.

Capstone Journal #4

Explain the development of your role within the processes of constructing and testing your team prototype throughout the last two years.

Building a testable prototype is one step of the EDP. How many times did you test your prototype, and how did the results compare to your design requirements? Explain.

Using a Global Positioning System (GPS) is a form of communication. Explain how GPS technology could be helpful in your Capstone.

In Biology you have studied the Nervous System. Compare the communication processes of the nervous system to the communication process in your Capstone project.

Capstone Journal #5

At STEM School you worked through five capstone projects related to the following topics, housing, energy, water, industry and communication. Which one of these projects you would like to continue after joining the college or university? Explain your answer.

Engineering Design Process (EDP) are consequence steps, related to each other in order to have a final product, Describe your capstone project in terms of a. The problem b. The design requirement/s c. The test plan (Note that Your answer should shows how these components are related to each other.)

In Biology you have studied about Nervous system and in earth science you have studied about Plate Tectonics. Which of these two topics was more helpful in building your communication capstone project? Explain why.

In Biology you have studied the location and function of several types of sensory receptors. What types of “sensory receptors” are you using in your Capstone project and what are their functions?

Capstone Journal #6

Provide an example where you changed your viewpoint about your Capstone OR improved your capstone based on new information found during researching previous solutions. Explain why the new information changed or improved your viewpoint.

Imagine you are in the process of talking to a potential buyer of the solution you are designing. Identify at least two of the system's design requirements that you consider its main selling points and explain why.

In Chemistry you have been learning about good laboratory investigation. Describe a well designed experiment for your capstone prototype.

Describe an oscillation that occurs in your capstone project and apply the terms amplitude and frequency in your description.

2017

اسئلة 2017 كانت عبارة عن اربع اسئلة في 5 امتحانات

الاسئلة اللى بالأحمر دي متقسمة سؤال لعلمي علوم وسؤال لعلمي رياضة

Capstone Journal #1

Students have many ways to learn. Some students work best alone, others in groups. Some students learn best from books and others from searching the internet or listening to lectures. In your four previous Capstones you have tried different ways to learn about the problems and solutions. Describe your own least effective way to learn and your own most effective way to learn. Explain why one method is effective for you and the other is not. *

(CP.3.01) Your team has selected a problem to solve that involves communications and climate change. Describe the problem you have selected as if your audience was a TV interviewer. The interviewer will want to know what causes the problem and what impact the problem is creating. *

(BI.3.01) How would you build a communication system using what you know about the parts and function of nervous system. Be sure to compare the two systems in your answer. *

(MA.3.01) In Math you have started to study differentiation. How could differentiation be useful for analyzing climate data? Give an example. *

(CH.3.02) In Chemistry you have been studying uncertainty in measurement. Select one measurement you might conduct in your capstone and describe with detail two possible sources of uncertainty in your measurement. *

Capstone Journal #2

In Capstones, managing your time and creating a plan is important for success. Write a draft plan including goals, actions you will take, and deadlines for this semester to describe how you will get your Capstone project work completed in the required time. *

Scenario A company that manufactures automobile airbags has a problem with high rate of failure in the inflation of the bag. During testing, 10 percent of the bags do not fully inflate. An engineer is assigned the job of solving the problem. The engineer first defines the problem as a failure in the materials and construction of the inflation device. The engineer begins to solve this problem by producing a more robust inflation device. After considerable effort, the data shows that improving the inflation device does not change the failure rate in the bags. Question: Explain the key mistake this engineer made in using the engineering design process. How would the engineer make this work better? *

In English you are learning to listen to reflect on ideas and make inferences. What is the difference between an inference and an observation? Describe an example of the difference between inference and observation based on your research into Climate Change. *

In Physics you have been studying about reflection and refraction which can be applied to how the sun's rays interact with the Earth. Explain how these phenomena are affecting climate change. *

Capstone Journal #3

Describe a time during a capstone project when you did not understand some information. How did you solve this problem as a team? Give an example. *

Write two design requirements for a new laboratory for the new STEM Schools. Explain how you will test and measure these design requirements. *

(CH.3.03) In Chemistry you have been studying what makes a good experimental design. Describe an example of a good experimental design related to the challenge of climate change and explain why it is a good experimental design. *

(CS.3.01) In Computer Science you have been studying the requirements to make a mobile application. Mobile applications can have advantages over desktop or computer applications. (1) Describe a new mobile application that could be useful for the challenges of climate change. Include the aim, the target audience, and the data that is communicated. (2) Explain why this mobile application would be more useful than a desktop or computer application? *

Capstone Journal #4

There are many techniques or ways of study you used to earn high grades in Capstones. What is the most important piece of advice you would give to a new STEM student on how to prepare for success in Capstones? Explain why you think this advice is MOST important. *

As your team researches and gathers information on prior solutions for your Capstone Challenge, identifying credible (valid or trustworthy) sources is important. Give an example of an internet source you used and explain why you thought it was a credible (valid or trustworthy) source. Give an example of an internet source you did NOT use because it was not credible and explain why. *

ST(3.01) In statistics you are learning to explain and apply the principles of survey design and data collection. Design a survey to study an issue related to climate change. Your answer should include the following: Survey purpose Parameters, and Sampling distribution *

ES(3.02) In Earth Science you have been studying how global positioning systems (GPS) technology is used to measure the motion of tectonic plates. Suggest a way to use GPS technology to address the climate change issue. Explain your answer. *

Eng (3.03) In English, you are learning about determining an author's point or purpose. Read the following paragraph and describe the author's point of view about global warming. Provide an example from the paragraph to support your conclusion. "Global warming is not an output of computer models; it is a conclusion based on observations of a great many global indicators. By far the most straightforward evidence is the actual surface temperature record. While there are places — in England, for example — that have records going back several centuries, the two major global temperature analyses can only go back around 150 years due to their requirements for both quantity and distribution of temperature recording stations." *

Capstone Journal #5

Your Capstone Challenge requires you to apply your STEM content knowledge. Select one STEM subject area connected to your current Capstone Challenge. Explain how this subject area is connected to your current Capstone Challenge. Identify a suggestion to strengthen the connection between this subject area and the Capstone Challenge and explain your idea. *

Your recommended solution to the Capstone Challenge should meet your design requirements. What solution design requirement/s are you testing with your prototype? Explain how you tested for the design requirement/s. *

(PH.3.03) In Physics you have been studying oscillatory motion. Select one example of an oscillatory motion or oscillatory process associated with the climate. Explain your example using key terms including amplitude, period and frequency. *

During your research for your capstone work (Grades 1, 2, and 3), you may have found a topic that inspires you to continue to study this topic after high school. Explain the topic and why you are passionate about it. *

OBOUR STEM SCHOOL