NARRATIVE FOR STEM CAREER PRESENTATION (**Grades 6-12**)

Slide 1 – STEM & Your Future
Welcome to a presentation on STEM and your future.

Slide 2 – What is STEM?
What is STEM? STEM is an acronym. It stands for Science, Technology, Engineering and Mathematics.

Slide 3 – Why is STEM Important?
Why should you care about STEM? Well, for starters, it creates high paying jobs. We all want to make lots of money, right? STEM also solves problems. We have cleaner air and water, better medical technologies that have extended the human lifespan and decreased the amount of pain we have to experience…the list goes on and on. Solving all these problems improves our quality of life, and creates a better world for everyone. Everybody gets to benefit from STEM.

Slide 4 – Benefits of a STEM Career
So what do you get by pursuing a career in science, technology, engineering, and mathematics? You get to make lots of money, which we will go into later. You get to do exciting work. By being part of STEM, you quite literally are creating the future, whether it's the development of new technologies or making new discoveries. You also have more job security. You are less likely to lose your job during economic downturns because you have skills that employers want. You also get to contribute to society, and that, in-turn, gives your life meaning/purpose, because we all want to feel relevant, that we're valued by others. There's no better way to achieve that than through the STEM fields.

Slide 5 – Examples of STEM Degrees
Now we are going to talk about some examples of STEM degrees. Many of these degrees did not exist 20 years ago, so you're fortunate to have the opportunity to pursue these degrees.

Slide 6 – Astronautical Engineering
Astronautical engineering is a career in building spaceships. When you're an adult, if someone asks you what you do for work, with this degree you can tell them you build spaceships. Pretty cool. You make over $150,000 to be part of this, and you have options on what part you want to work on. You can develop & test the rocket engines, design & build the spacecraft, or even work on developing life support systems. Life support systems are what keep humans alive in space. So everything we need to survive on Earth, like oxygen, water, tolerable temperature, the right atmospheric pressure, etc., we need to provide to people in space. Now I have a short video to show you that highlights California's aerospace industry. (SHOW VIDEO)

Slide 7 – Nanotechnology
Nanotechnology. Nano means small in Greek, so it's small technology. With a nanotechnology degree, you can manipulate atoms & molecules to develop new technologies. You see, as we go smaller & smaller, things start to behave differently from what we would expect, and those changes are what scientists try to utilize for our benefit. You'll make over $100,000, and you can do some amazing things. You can build small robots called nanites, which is seen in the

above picture. Eventually, we will mass produce these nanites, and we can then program them to do whatever we want. For example, we could program nanites to protect our bodies from viruses & bacteria, ensuring we seldom, if ever, get sick. There are so many options here. You can also develop new tools. The below animation was taken with an amazing microscope, called a scanning electron microscope. We get to see the micro world in a way we have never been able to before. You can also develop entirely new materials, such as carbon nanotubes, which is something we'll discuss later.

Slide 8 – Plasma Physics

Plasma is the 4th state of matter, and it is the most common state of matter because that's what all the stars are made of: plasma. Our Sun can be described as one big plasma ball. What are the first three state of matter? Think of an ice cube. An ice cube is a solid. That is the first state of matter. What happens when we apply heat? It starts to melt, turning the solid ice cube into a liquid, water, which is the second state of matter. What happens if heat is then applied to a liquid? It evaporates and goes from a liquid to a gas, which is the third state of matter. Now, if you keep applying more heat, then that gas can be turned into a plasma, the 4th state of matter. As I said, it's what the stars are made of.

Of all the college degrees in this presentation, this degree pays the most, at over $175,000 a year. So, what can you do with a plasma physics degree? You can work on advancing space propulsion. Plasma can be used to propel a spacecraft, and it's much more efficient than current rocket technology. For example, instead of taking several months to get to Mars, it could take several weeks with plasma propulsion.

You can also research plasma as a clean energy source. That is one of the research goals of the National Ignition Facility, pictured in the middle. This facility is located in California, and they are recreating temperatures inside the Sun; basically, they're creating a mini-Sun. This is achieved through a bunch of lasers shooting one tiny area simultaneously to create fusion, which is what powers the stars. Fusion power could provide society with a clean, inexhaustible, and essentially free source of power.

Finally, because plasma is what makes up the stars, you can also use this degree to study the stars, including our own Sun. Speaking of the Sun, I have a video to show you that is remarkable. Thanks to NASA, for the first time in human history, we can now see the Sun up close. (SHOW VIDEO)

Slide 9 – Robotics Engineering

If you like robots, then this is the degree for you. With a robotics engineering degree, you can build the robots, program them, or run experiments with them…all the while making lots of money. Employers are continually looking to hire people with these kinds of skills, so if you choose this degree, you will have lots of work for your entire career, because the growth in robotics will continue well into the future.

Going back to the beginning of this presentation, we talked about how the STEM fields improve society and can give life meaning & purpose. The next video really highlights those points. Through STEM, people are now being given the opportunity to walk again. To be able to give

someone the ability to walk again is worthy of recognition for such an amazing contribution. They will be remembered, and they deserve lots of money for it. (SHOW VIDEO)

Slide 10 – STEM allows you to be part of the future.
If you decide to have a career in one of the STEM areas, here are some of the incredible things you can be part of.

Slide 11 – Aerogel
Aerogel is the least dense solid known. It's 99.8% air, and can support up to 1000 times its own weight. This material holds numerous records, including the highest insulation properties known to exist. What this means is that if you had a home in Alaska, and it was the middle of winter, if you had this material lined into your home, you could turn your heat on to whatever temperature you'd like, and once it reached that temperature, you could turn your heat off, and it would stay that temperature the entire day. (PASS OUT ANY SAMPLES TO STUDENTS)

Slide 12 – 3D Printers
3D printers. These are printers that can produce 3D objects, and this area is growing at incredible rates, with no end in sight. With a 3D printer, we can already print food, organs, medicine, rocket parts, and prosthetic limbs. And 4D printing is already on the way. What is 4D printing? It's the same things as 3D printing, except that the objects it prints out can react to external stimuli. It can reshape or reconfigure itself based on how it has been designed. So what might this look like? Well, if we use 4D printed materials to build a water pipe, if a water pipe leaks, then the pipe could modify itself to stop the leak. There's so much potential here.

Slide 13 – Gold Nanoparticles
Gold nanoparticles. Let's break that name down. Remember that nano means small in Greek, so small particles and they're made of gold. Hence the name, gold nanoparticles. These will be used to both detect and kill cancer cells. No more radiation, no more pain & suffering, and no more people dying from cancer. That is the promise of gold nanoparticles. They are designed through a nanotechnology process, and there's two ways that these gold nanoparticles are going to kill cancer.

The gold nanoparticles are superheated with a laser, and they're designed to search out cancer. Once they find the cancer cells, they collide with them. Since they're superheated, the cancer cells are destroyed from coming into contact with the gold nanoparticles. Alternatively, instead of killing cancer with heat, you can also have gold nanoparticles carry medicines that can kill cancer cells. Either way can work. The bottom graphic shows over a six hour period the cancer, which is in green, being located by the nanoparticles, which look a little pink.

Many people suffer & die from cancer. We now have a way to end that pain, but it will be determined by what degrees you decide to pursue, and how we as a society choose to invest government funding.

Slide 14 – Space Elevator
The space elevator is what it sounds like…an elevator that can take you into space. This would be the greatest construction project in human history. Building a space elevator will make access

to space much more affordable. Right now, it costs about $10,000 per pound to send something into space. With a space elevator, that cost could come down to $100 per pound…a huge cost differential. This would be made with carbon nanotubes. Carbon nanotubes are a new kind of material that's made through a nanotechnology process. Implied in its name, carbon nanotubes are made up of carbon atoms, arranged in a tube-like form. They are hundreds of times stronger than steel, and six times lighter. Carbon nanotubes can also withstand higher temperatures & pressures than steel. Scientists have already made carbon nanotubes in the lab, but in very tiny amounts that cost a significant amount. Someone has to figure out how to mass produce them at a reasonable cost. As for the space elevator, research & experiments are being conducted to see how we might achieve this. The video you're about to see is animation of what a space elevator might look like, although it's more of a ride than an elevator. (SHOW VIDEO)

Slide 15 – Stratosphere Jumping
Ever wanted to jump from the edge of space? Soon you will have that opportunity. This was successfully attempted in 2012 by Felix Baumgartner. As a result of that effort, three new companies have formed. They are developing spacesuits that you and I would use when jumping from the stratosphere. This activity will be available in the near future. The video you're going to see is the body-cam footage from the 2012 jump. (SHOW VIDEO)

Slide 16 – Underwater Habitats
If you've ever wondered what it would be like to live underwater, then you're going to have the opportunity to find out. Underwater restaurants and hotels already exist. Both pictures on the right are actual places. The top-right picture is located in the Maldives. The bottom-right picture is located near Israel. There are plans for the development of underwater hotels in Dubai, and also permanent residences. People actually want to permanently live beneath the ocean's surface. It is very likely that, in your lifetime, you can choose to live on land, underwater, or for a limited time, in space. Now here's a video of the restaurant pictured top-right. (SHOW VIDEO)

Slide 17 – Questions
(ANSWER STUDENT QUESTIONS)