Scientific method controls and variables part 1

What does it mean to conduct research? What are the different stages of the research process? What are the requirements of modern scientific research? How do I analyze a scientific paper? This course will teach you how to conduct research according to scientific methodology. You will learn how to analyze scientific articles on engineering and science topics, and how to conduct scientific experiments. The course will help develop a scientist's basic skill, giving him the research tools to succeed. The course material is suitable for anyone interested in the problems of discovering knowledge and science; methodology for the achievement of educational and scientific activities. This course is for anyone who has said: Science is interesting. It will be of interest to those who want to learn the processes behind modern scientific research. Understanding the fundamental problems of science Ability to analyze scientific articles How to properly carry out scientific research and experiments Week 1: The philosophical aspects of scientific activity Introduction to the Philosophy of Science. What is a scientific theory? The structure of a scientific theory. The methodology used to gain scientific knowledge. Requirements for scientific results. Week 2: Theory and Practice of Scientific Research What is research? Doctoral requirements. Research planning. Research question. Research modes. Induction and deduction in your research project. Week 3: Philosophical principles of ontology and epistemology research. Objectivity and subjectivity. Cause and correlation in your research project. Week 4: Research Process Literature Review. Research questions and hypotheses. The structure of the paper and the research of the plan. Impact on research. Week 5: Methodology of the experiment in engineering studies The purpose and structure of the experiment. Planning. Analysis of the results. Receive a certificate signed by an instructor with the institution logo to verify your achievement and increase your employment prospectsAdd the certificate to your resume or resume, or post it directly on LinkedInGive an additional incentive to complete the CourseEdX, a non-profit organization, relies on verified certificates to help fund free education for all of which worldwide quality control is a matter of checking and re-checking various components in the manufacturing and marketing process to ensure that the product or service provided is satisfactory and safe for all involved. There are different types of quality control methods industry and also in the structure of the company. These include checking product durability and safety, implementing total quality control programs, and the ability to gain customer information. Quality assurance is a basic quality control method, used in multiple industries, including call centers (when an automated system is called and it is indicated that your call can be to ensure quality). People are listening to the call to make sure you get the best service. During quality control in the manufacture of vehicles and other items, there may be inspectors who test the product to ensure that it meets established company standards. In addition, companies test all the individual components that make up the individual product or service for quality and satisfaction. For consumable products, such as food, inspectors can use electronic systems to search for harmful chemicals. Inspectors are also looking for mold and bacteria that could indicate that food is spoiled. Product testing usually includes breaking or damaging a product to see how well it is maintained. An example of this is when new cars undergo rigorous crash tests to determine how safe and effective they are before selling them to customers. Pharmaceutical industries test and retest medicines before the U.S. Food and Drug Administration indicates that they are safe for human consumption. Another testing option is to use a product several times and place it in extreme circumstances and conditions until it fails, in order to see how it is maintained; this is error-proof. Companies that manufacture computers run physical hardware durability and functionality tests to ensure systems are powered on correctly and do not have faulty components. They can also run software that looks for hardware and software issues before sending computers to vendors. The marketing department or financial departments within a company may notice a drop in sales or a decrease in the share price. As a result, the company could test each product department or component to find out if the quality has run out, which may explain declining sales or consumer demand. For example, a sales company might examine the customer service department to determine whether sales agents provide fast, quality service to customers. At the same time, you can examine the marketing department to evaluate the effectiveness of your company's promotional activities. Consumers use the product or service and can provide information. Focus groups, surveys, and test subjects may be needed to determine if there are any issues with the item that the company can correct. For example, retail stores sometimes mention a buyer's survey on the customer's receipt and offer some reward, such as a discount, to increase the likelihood of Customer input and suggestions exist in virtually any industry, including entertainment (video games and movies), vehicles and appliances. Let's break down the definition of science. Part 1 Science is practical. Although science sometimes involves learning from textbooks or teachers in conference rooms, its main activity is discovery. Discovery is an active and practical process, not something done by isolated scholars of the world in ivory towers. It's both a search information and a search to explain how information fits in meaningful ways. And it almost always seeks answers to very practical questions: How does human activity affect global warming? Why are bee populations suddenly declining in North America? What allows birds to migrate such long distances? How do black holes form? Science is based on observation. Scientists use all their senses to gather information about the world around them. Sometimes they collect this information directly, without any tools or appliances involved. Other times they use equipment, such as a telescope or microscope, to collect information indirectly. Either way, scientists will write down what they see, hear, and feel. These recorded observations are called data. Part 3 Data can reveal the structure of something. This is quantitative data, which describes an object numerically. The following are examples of quantitative data: The body temperature of a ruby throat hummingbird is 40.5 oC (105 oF). The speed of light is 299,792,458 meters per second (670,635,729 mph). Jupiter's diameter is 142,984 kilometers (88,846 miles). The length of a blue whale is 30.5 meters (100 feet). Notice that quantitative data consists of a number followed by a unit. Unit is a standardized way to measure a particular dimension or quantity. For example, the foot is a unit of length. So is the meter. In science, the International System (SI) of units, the modern form of the metric system, is the global standard. Part 4 data may also reveal behavior. These are qualitative data, which are written descriptions of an object or organism. John James Audubon, the naturalist, ornithologist and painter of the 19th century, is famous for his qualitative observations on bird behavior, such as this: Scientists generally collect quantitative and qualitative data, which also contribute to the body of knowledge associated with a particular subject. In other words, quantitative data is no more important or more valuable because they are based on accurate measurements [source: Audubon]. Next we will learn about science as a systematic and intellectual search. As further proof that there is not a single way to do science, different sources describe the steps of the scientific method in different ways. Some list three steps, about four and about five. Fundamentally, however, they incorporate the same concepts and principles. For our purposes, let's say there are five key steps in the method. Almost all scientific research begins with an observation that arouses curiosity or raises a question. For example Charles Darwin (1809–1882) visited the Galapagos Islands (located in the Pacific Ocean, 950 kilometers west of Ecuador, observed several species of finches, each uniquely adapted to a very specific habitat. In particular, the peaks of the finches were quite variable variable seemed to play an important role in the way the birds got food. These birds captivated Darwin. I wanted to understand the forces that allowed so many different varieties of finches to successfully coexist in such a small geographical area. His remarks made him wonder, and his astonishment led him to ask a question that could be proven. Step 2: Ask a question The purpose of the question is to limit the approach of research, to identify the problem in specific terms. The question Darwin might have asked after seeing so many different finches was something like this: What caused the diversification of finches in the Galapagos Islands? Here are some other scientific questions: What causes a plant's roots to grow downwards and the stem to grow upwards? Which mouthwash mark kills the most germs? Which form of car bodywork reduces air resistance more effectively? What causes coral bleaching? Does green tea reduce the effects of oxidation? What kind of building material absorbs the most sound? Getting to scientific questions is not difficult and does not require training as a scientist. If you've ever been curious about something, if you've ever wanted to know what caused something to happen, then you've probably already asked a question that could initiate scientific research. Step 3: Formulate a hypothesis The best

thing about a question is that it yearns for an answer, and the next step in the scientific method is to suggest a possible answer in the form of a hypothesis. A hypothesis is often defined as an educated assumption because it is almost always informed by what you already know about a topic. For example, if you want to study the air resistance problem mentioned above, you may already have an intuitive feeling that a bird-shaped car would reduce air resistance more effectively than a box-shaped car. You could use that intuition to help formulate your hypothesis. Generally, a hypothesis is affirmed as a yes ... then statement. In making such a statement, scientists engage in deductive reasoning, which is the opposite of inductive reasoning. Deduction requires movement in the logic from the general to the specific. Here's an example: If a car's body profile is related to the amount of air resistance it produces (general declaration), then a car designed as a bird's body will be more aerodynamic and reduce air resistance more than a car designed as a box (specific declaration). Note that there are two important qualities about a hypothesis expressed as if ... then statement. First of all, it can be tested; you could set up an experiment to test the validity of the statement. Secondly, it is an experiment might be devised that might reveal that such an idea is not true. If these two qualities are not met, the question being asked cannot be addressed using the scientific method. Method. Method.