BEST Medicine Project Ideas

Topic	Ages	Possible categories
• Design a household feature that allows for easier wheelchair access. o *Sample Projects:* Adjustable counter heights, washers and dryers with relocated controls, redesigned refrigerator with automated movement of shelves etc.	All ages	Rehabilitation
• Design a device that enables dressing without hands, for patients with upper-limb amputations.	All ages	Rehabilitation or Orthopedic
• Imitate the structure of a pufferfish to develop a system for delivering medicine to a wound. (Consider adding features to a balloon that cause spikes to open and deliver medicine.)	All ages	Biomaterials or Polymer Medicine or Wound Healing
• Design face masks to protect astronauts from breathing fine lunar dust. Note that lunar soil has very fine particles.	All ages	Microgravity Medical Devices
• Design clothing that monitors/responds to body temperature. o *Sample Project:* Design clothing that regulates changes in body temperature, to prevent hypo/hyperthermia.	All ages	Sensors/Imaging or Biomaterials

• Design a GPS device that can be used by patients with limited or no vision.
   o *Helpful Links:*
      ▪ *Android App Inventor:* http://appinventor.googlelabs.com/about/
	All ages	Rehabilitation or Sensors/Imaging or Medical IT

• Improve the design of nasal gastric tubes. o *Sample Project:* Nasal Gastric tubes require repetitive flushing/cleaning; can this be done automatically?	All ages	Health/Medicine or Polymer Medicine
• Design a new method to help people stop snoring.	All ages	Health/Medicine or Clinical Trials
• Design a device that detects sleep apnea, or an alarm to prevent sudden infant death syndrome (SIDS).	All ages	Sensors/Imaging or Health Medicine
• Design a suturing system based on the way a grapevine tendril wraps itself around a fence wire.	All ages	Polymer Medicine or Wound healing
• Create and build a voice-controlled household appliance.	All ages	Rehabilitation or Medical IT
• Develop a model to simulate bone degeneration. o *Hint:* Hard setting foam is a helpful material!	All ages	Orthopedics or Biomaterials or Modeling/ Simulation
• Design a monitoring system that measures how long patients remain in one position while sleeping, to prevent the occurrence of bed sores.	All ages	Sensors/Imaging or Wound Healing
• Design a model to simulate how the diameter of a blood vessel is related to the flow rate, in order to examine the various aspects of atherosclerosis. o *Hint:* Bernoulli's Principle applies!	All ages	Cardiovascular or Modeling/ Simulation

	All ages	Health/Medicine or Clinical Trials
• Develop an experiment to test whether the major supplements available at health and nutrition stores actually increase muscle enhancement. o *Hint:* Recruit the football team, and work with a nutritionist to monitor protein intake!		
• Develop a study to compare generic to name brand medications.	All ages	Health/Medicine or Clinical Trials
• Develop a device that allows quadriplegic patients to take pills without assistance. o *Hint:* Movements originating from the neck upwards can be used!	All ages	Rehabilitation or Sensors/Imaging or Health Medicine
• Develop a mechanical model of the knee. o *Sample Project:* Examine how different weight bearing situations affect the risk of injury. Consider making a model of a knee using elastic bands and wood.	All ages	Orthopedics or Biomaterials or Modeling/ Simulation
• Design an experiment to test how the digestion of protein differs at various pH levels. **Please do not use corrosive pH levels in your study.** o *Hint: Experiments with* agar gel can be used!	All ages	Modeling/ Simulation or Health/Medicine
• Design an electronic menu for ordering food in hospitals. o *Sample Project:* Create a menu that knows a patient's history, and only displays meal options that are appropriate when patients require strict dietary control.	All ages	Health/Medicine or Medical IT
• Design an office chair that can help reduce back/neck pain.	All ages	Orthopedics or Modeling/ Simulation or Health/Medicine
• Design a casting method for the creation of boots for patients with diabetes. o *Hint:* Try total contact casting! *Helpful Link:* http://www.youtube.com/watch?v=a4LJldGHbbA	All ages	Rehabilitation or Wound Healing or Biomaterials
• Develop a new and improved method to help smokers quit.	All ages	Health/Medicine or Clinical Trials
• Design a shoe that senses when "too much" pressure falls on a particular part of the foot (anything over 60 mmHg). o *Hint:* Think of both the plantar and dorsal surfaces of the foot!	All ages	Health/Medicine or Clinical Trials or Wound Healing or Sensors/Imaging
• Assess the merits of various gel-like materials for use with ultrasound or EKG probes. Does honey work as well, or are there other gels that freely available in Third World countries that could work equally well?	All ages	Health/Medicine or Biomaterials or Sensors/Imaging
• Develop a game for astronauts to relieve stress during long-duration space missions. The game should not have pieces that can get lost in a microgravity environment.	All ages	Microgravity Medical Devices

• Develop an experiment to test via human circulation cycles, if your body temperature can tell the time of day.
   o *Helpful Link:*
       http://www.sciencebuddies.org/science-fair-projects/project_ideas/HumBio_p020.shtml
	All ages	Sensors/Imaging or Health Medicine or Cardiovascular or Modeling/ Simulation

• Develop a study to compare natural antacids with synthetic (chemical) antacids (in a beaker).
   o *Helpful Link:*
   http://www.virtualsciencefair.org/2010/rossxc2
	All ages	Health Medicine or Biomaterials or Modeling/ Simulation

• Design an experiment to test different materials, and determine which has the properties most similar to bone.
   o *Hint:* Bending, breaking strength etc.!
• Develop a study to determine if drinking water from a bottle by mouth, or straw will contaminate the remaining water more with bacteria from the mouth.
   o *Helpful Link:*
   http://www.usc.edu/CSSF/History/2005/Projects/J1302.pdf
	All ages
	
	All ages
		Orthopedics or Biomaterials or Polymer Medicine
		Health Medicine or Modeling/ Simulation

• Develop a study to investigate the role of herbal products, clove oil, turmeric and neem extract on the prevention of periodontal disease.
   o *Helpful Link:*
   http://www.usc.edu/CSSF/History/2006/Projects/J1327.pdf
	All ages	Health Medicine or Modeling/ Simulation or Biomaterials or Clinical Trials

• Develop a study to compare the antioxidant effects of natural and synthetic preservatives.
   o *Helpful Link:*
   http://www.virtualsciencefair.org/2010/songxa2
	All ages	Health Medicine or Modeling/ Simulation or Biomaterials

• Redesign daily household items for patients with arthritis. o *Sample Projects:* Gear shifters, hairbrushes, gas pump handles etc.	All ages	Rehabilitation or Orthopedic
• Design weight training equipment for patients with amputations. o *Hint:* Pick a specific type of amputation, and focus on a design for that specific condition!	All ages	Rehabilitation or Orthopedic
• Develop a portable device that can be used to provide wheelchair access to different buildings.	All ages	Rehabilitation
• Modify the design of crutches for increased comfort. o *Sample Project:* Does weight bearing always need to occur at the axillary (underarm) region?	All ages	Rehabilitation or Orthopedic
• Design a game to be used for speech therapy.	All ages	Rehabilitation or Clinical Trials
• Develop an automatic pill dispenser. o *Sample Project:* Patients with high blood pressure and heart failure take many pills. Can this be simplified?	All ages	Health Medicine or Clinical Trials

	All ages	Rehabilitation or Clinical Trials
• Develop customized musical instrument supports for patients in wheelchairs.	All ages	Rehabilitation or Clinical Trials
• Design a device for turning pages to help patients with disabilities read.	All ages	Rehabilitation or Clinical Trials
• Develop a study to compare dental cements. o *Hint:* Compare materials that cure via catalyst and light!	All ages	Health Medicine or Biomaterials or Polymer Medicine

• Develop a study that uses an AmmSensor to monitor movement during sports/physical therapy.
   o *Helpful Link:*
   http://www.ammsensor.com/
	All ages	Rehabilitation or Clinical Trials or Health Medicine

o Design a more comfortable backpack for joggers. o *Sample Project:* Think about ideal weight distribution to prevent injury from recurring use of the backpack.	Grades 6-8	Rehabilitation or Clinical Trials or Health Medicine
o Design a backpack that is less stressful on a child's back. o *Sample Project:* Think about ideal weight distribution to prevent injury from recurring use of the backpack.	Grades 6-8	Rehabilitation or Clinical Trials or Health Medicine

o Develop a method for sterilizing a toothbrush before each use.
   o *Helpful Link:*
   http://www.usc.edu/CSSF/History/2005/Projects/J1333.pdf
	Grades 6-8	Health Medicine or Biomaterials or Polymer Medicine

o Design a method of identifying patients, without the use of plastic bracelets.	Grades 6-8	Clinical Trials or Health Medicine or Medical IT
o Conduct a study to find out which type of lighting is best for the eyes in an office. o *Hint:* Consider the effects of different monitors on the human eye!	Grades 6-8	Clinical Trials or Health Medicine

o Develop an experiment to identify which parts of the hand are most difficult to wash, and design a device to help the problem areas.
   o *Helpful Link:*
   http://www.sciencebuddies.org/science-fair-projects/project_ideas/MicroBio_p018.shtml?from=Home
	Grades 6-8	Clinical Trials or Health Medicine or Sensors/Imaging

o Explore the role of evolution on the morphology of an organism by playing multiple iterations of Spore. o *Sample Project:* Compare morphology based on aggressive or defensive behaviors; other strategies can be compared too. See: http://www.spore.com/	Grades 6-8	Modeling/ Simulation
o Develop a study to evaluate the effectiveness of mosquito nets so as to better prevent insects from getting inside the net.	Grades 6-8	Polymer Medicine or Health Medicine
o Develop a study to test if cooking methods affect the nutritional content of food. o *Sample Project:* Does baking, frying, sautéing a potato alter the nutritional content of it?	Grades 6-8	Health Medicine
o Design an improved bottom for canes and walkers, in order to prevent slipping on wet surfaces.	Grades 6-8	Polymer Medicine or Biomaterials

o Develop a device to help elderly patients open jars.	Grades 6-8	Rehabilitation or Orthopedic
o Redesign an anesthesia mask. o *Sample Project:* Evaluate how children react to current masks, and redesign accordingly	Grades 6-8	Polymer Medicine or Biomaterials
o Design an experiment to test which foods produce brain freeze most often. o *Helpful Link:* http://www.usc.edu/CSSF/History/2005/Projects/J1409.pdf	Grades 6-8	Health Medicine or Cardiovascular
o Develop an experiment to test how digestion is affected by different concentrations of glucose. **Please do not use corrosive pH levels.**	Grades 6-8	Modeling/ Simulation
o Develop a model to simulate the failure of a balloon angioplasty. o *Hint: You can use dried play dough to model calcified arterial wall!*	Grades 6-8	Modeling/ Simulation or Cardiovascular
o Simulate different bone fractures using carrots. o *Hint: Bending/twisting and compressing carrots cause different fracture patterns. Compare these to actual bone fractures.*	Grades 6-8	Modeling/ Simulation or Orthopedic
o Design an astronaut glove that does not cause hand fatigue when used during extra-vehicular activities	Grades 6-8	Microgravity Medical Devices
o Compare performance in an underwater simulator to that in true microgravity. (e.g., the task could involve turning a wrench to tighten a bolt).	Grades 6-8	Microgravity Medical Devices or Modeling/ Simulation
o Simulate the calcification of heart valves using pasta. o *Hint:* A zone of uncooked pasta can be used to resemble a calcified heart valve!	Grades 6-8	Modeling/ Simulation or Cardiovascular
o Develop a study to test the effect of electrical simulation on normal human fibroblasts, which have an active role in wound healing. o *Helpful Link:* http://www.sciencellonline.com/	Grades 6-8	Modeling/ Simulation or Wound Healing
o Design an Android App for measuring wound size, based on photographs taken from a cell phone. o *Helpful Link:* Android App Inventor: http://appinventor.googlelabs.com/about/	Grades 9-12	Modeling/ Simulation or Wound Healing
o Create binocular vision, using only one eye. o *Sample Project:* Explore the use of optics and lasers.	Grades 9-12	Sensors/Imaging
o Design a device that can locate veins before the use of a needle. *Hint:* Sensitive microphones can be used to "listen" to blood flow!	Grades 9-12	Sensors/Imaging or Cardiovascular
o Design a silent (or quieter) dentist drill. *Hint:* High speed hardware drills like the Dremel can be used!	Grades 9-12	Health Medicine or Microgravity Medical Devices

	Grades	
o Design a wheelchair that can be controlled by quadriplegic patients. *Hint:* Movements originating from the neck upwards can be used!	Grades 9-12	Rehabilitation or Clinical Trials or Health Medicine
o Develop a model to simulate implant loosening. o *Sample Project:* Ball and socket joint of the hip.	Grades 9-12	Modeling/ Simulation or Orthopedic
o Design a high-efficiency respirator that draws upon, and condenses oxygen in the air rather than using a tank.	Grades 9-12	Rehabilitation or Health Medicine
o Design a study to test the effectiveness of alternative methods for preventing motion sickness, without the risks and side-effects of current pharmaceutical options.	Grades 9-12	Clinical Trials or Health Medicine
o Design clothing that can sense the acceleration of heart rates, sending an alert when the heart rate has exceeded a certain level. o *Hint:* Use the range of 110-130 beats per minute and conduct mandatory physical prior to testing!	Grades 9-12	Sensors/Imaging or Cardiovascular or Clinical Trials or Health Medicine
o Design a wheelchair that can maneuver up and down stairs. o *Hint:* Limit your design to 2-3 steps!	Grades 9-12	Rehabilitation
o Develop a study to test if cherries and cranberries can be used as an alternative treatment for inflammation. *Helpful Link:* http://www.odec.ca/projects/2003/herna3j/public_html/	Grades 9-12	Modeling/ Simulation or Wound Healing
o Design a new exercise device to keep astronauts' legs healthy	Grades 9-12	Orthopedic or Microgravity Medical Devices
o Design a method for measuring an astronaut's mass in space	Grades 9-12	Microgravity Medical Devices
o Design a system for measuring psychological stress in astronauts during long duration space missions	Grades 9-12	Microgravity Medical Devices
o Design a surgical instrument for use by astronauts.	Grades 9-12	Microgravity Medical Devices
o Design a method for measuring bone loss in astronauts during missions lasting more than 3 months.	Grades 9-12	Microgravity Medical Devices or Sensors/Imaging
o Develop a study to test the effectiveness of alcohol based vs. non-alcohol based hand sanitizers.	Grades 9-12	Wound Healing or Health Medicine
o Assess the benefits of using a computer modeling program such as AIDA v 4.3b to simulate diabetes o Hint: Visit http://www.2aida.net/welcome/	Grades 9-12	Medical IT or Modeling/ Simulation
o Design a device to measure glucose without needing to prick a finger.	Grades 9-12	Sensors/Imaging or Cardiovascular
o Design a device to analyze strength (torque and motion) in the forearm for physical therapy.	Grades 9-12	Rehabilitation or Orthopedic or Sensors/Imaging
o Develop an improved method for transporting patients from one bed to another.	Grades 9-12	Rehabilitation
o Develop a study to examine the effects of load-splitting on the	Grades	Rehabilitation or

lower back. o *Sample Project:* The effects of lifting two loads to the side, versus one heavier load to the front.	9-12	Orthopedic
o Design a device for removing perspiration from a prosthetic limb.	Grades 9-12	Rehabilitation or Wound Healing
o Develop a method for sensing when a person stumbles, and a prosthetic that will lock then stumbling occurs.	Grades 9-12	Rehabilitation or Orthopedic
o Develop a device for measuring punching force in boxing.	Grades 9-12	Sensors/Imaging
o Develop a method for measuring grip force during sports. o *Sample Projects:* Baseball bat, golf club, tennis racket.	Grades 9-12	Sensors/Imaging or Health Medicine
o Develop a method for measuring kicking force. *Hint:* Use as a model for common football/soccer injuries!	Grades 9-12	Sensors/Imaging or Health Medicine
o Create a device that converts sign-language signaling into audio communications o *Hint:* Wii remote can be used for finger tracking!	Grades 11-12	Medical IT
o Design computerized vision for the blind. o *Sample Project:* Haptic feedback in walking stick that senses obstacles.	Grades 11-12	Medical IT or Sensors/Imaging or Rehabilitation
o Write a Matlab program to predict bone loss (or strength loss) during space missions of varying durations.	Grades 11-12	Medical IT or Microgravity Medical Devices

o   Use Lego Mindstorm to monitor if a patient is taking his/her pills and send text/sms to a hospital database which remotely monitors patient compliance.
    o   *Helpful Links:*
        ▪ *Android App Inventor:*
http://appinventor.googlelabs.com/about/
        ▪ *Android Bluetooth remote controller :*
https://tomoueb.com/svn/nxosremote/android/nxosremote/
        ▪ *Mindstorm Project Page:*
http://mindstorms.lego.com/en-us/community/NXTLog/default.aspx
	Grades 11-12	Medical IT or Microgravity Medical Devices or Health Medicine

o Study and identify different techniques that could be used to recharge a pacemaker, to reduce invasiveness.	Grades 11-12	Cardiovascular or Sensors/Imaging

o   Explore the role of non-Newtonian fluids as a means of creating artificial knee joints.
    o   *Sample Project:* Regular use of a prosthetic (walking) vs. tripping, where the stiffness of the knee has to be different.
    o   *Hint*: Consider use of Oobleck!
	Grades 11-12	Sensors/Imaging or Rehabilitation

o Design a go-kart that can be controlled by a joystick, for children paralyzed below the waist.	Grades 11-12	Sensors/Imaging or Rehabilitation
o Design a device that simulates upper-limb amputation. o *Sample Project:* Use the device to model the current	Grades 11-12	Rehabilitation or Modeling/

	problems with today's prosthetics, or use your model to identify new problems with today's prosthetic solutions.		Simulation
o	Design a self-shifting seat cushion, to prevent bed sores.	Grades 11-12	Rehabilitation or Biomaterials or Wound Healing
o	Design a recharging device for hearing aids.	Grades 11-12	Sensors/Imaging or Rehabilitation
o	Complete a computational reconstruction of knee function. o *Hint:* MRI and CT scans require the development of non-metallic testing frames that can be utilized to position the knee and induce muscle activity with the knee in the scanner. You can also develop frames for validation of these techniques.	Grades 11-12	Sensors/Imaging or Orthopedics or Modeling/ Simulation
o	Design a multifunctional surgical instrument that can cut tissue and remove thin slices using a pincer arrangement (or combine two other features commonly used by surgeons) in a single instrument.	Grades 11-12	Polymer Medicine or Biomaterials
o	Design a new artificial ankle joint for patients with arthritis	Grades 11-12	Orthopedics or Biomaterials
o	Design a band-aid that does not stick to latex gloves	Grades 11-12	Biomaterials
o	Assess effects of knots on suture strength and develop a model to predict failure point	Grades 11-12	Polymer Medicine or Biomaterials or Modeling/ Simulation
o	Design an operating room that has no equipment that rests on the floor.	Grades 11-12	Health Medicine
o	Write a computer program that models patient wait times in various clinical settings (e.g., in a physical therapy setting).	Grades 11-12	Medical IT or Health Medicine
o	Assess risk of diabetes according to school menu lists.	Grades 11-12	Medical IT or Clinical Trials