**26.1 Robotics**

It is the branch of engineering-technology that involves the conception, design, manufacture and operation of robots. Most of the machines that we use today are a part of the Robotic technology that has encompassed our entire society and our lives.

**History of robotics in Education**

* The first educational robotics program called LOGO was introduced by Seymore Papert in 1980.
* LOGO is actually a programming language, he developed it to control robot “turtles”—to move them forward and backward, a specified distance, turn right or left a specified degree, drop a pen and draw.
* One of the next iteration of robotics education was LOGOs collaboration with Lego. It was first controlled through personal computers and later in the form of fully programmable bricks.
* This became what we know today as ***Lego Mindstorms.***
* Lego has continued to provide educational programs with its products for grades K-12 (from kindergartens to 12th class) with a variety of robotic capabilities.
* In addition to Lego, many companies now provide robotic building kits that educators can use to build systems thinking learn engineering and practice STEM concepts, following the theories of constructions.
* Options are out there for the smallest of budgets, as well as large-scale budgets. Worldwide, non-profit organizations have inspired the formation of robotics clubs, as well as international robotics competitions.

**What is “Robotics” in broad sense?**

* Robotics is related to the science of electronics, engineering, mechanics and software development.
* Robotics is a branch of technology that deals with design, construction, operation, structural disposition manufacture and application of Robots.
* An earliest design of a humanoid Robot was given by Leonardo Da Vinci.
* The concept of robotics was originally introduced in the middle ages for entertainment.
* Robotics has changed the structure of the society.
* With the advancement of science, robots are programmed to perform human functions.
* Robotics has crept into our daily lives.
* From calculators to the laptops, and large mechanical appliances like washing machines and cars, these robotic machines have helped to cut down the labour cost, thereby enhancing the end user product.

**Career options in Robotics**

* With the rising demand, a career in robotics has steadily gained pace among the creative and talented students.
* Revolution is created in the field of Robotics when imagination is coupled up with technology.
* Robotics is an essential component in any modern manufacturing environment.
* As factories increase their use of robots, the number of robotics related jobs will grow.
* Most of the machines that we use today are a part of robotic technology that has encompassed our entire society and our lives.
* Robotics has changed the structure of the society by providing safer work conditions, be it a production plant or extracting data from CD drives to cooking food in microwave, robotics has certainly made human life easier.
* As technology progresses, so too does the scope of what is considered robotics.
* 90% of robots could be found assembling car and other vehicles in automobile factories.
* With a wide spectrum of applications, there is an immense scope for a specialization in this ever expanding field.
* Robotic arms and legs will help disabled people.
* Robotics is a multi disciplinary stream or a career choice that helps students to acquire knowledge on each subject.

**Essentials of Robotics**

* Every branch of engineering plays a vital role when you get into robotics.
* Mechanical engineering
* Electrical engineering
* Computer engineering
* Electronics
* You need to be good at mechanical, electrical engineering and also be a good programmer and material scientist.
* Robotics allows multiple points of access to science and technology for students.
* In a vast expending and lucrative career options in robotics, researchers continue to improve on design, technology, machinery and overall benefits to end user.

**Learning of Robotics at school level**

* Robotics is a production-based learning module.
* While learning how science, technology, engineering and mathematics work and interact together, creativity is increased.
* So, teaching robotics in schools gives students the opportunity to address the growing demand of teaching STEM subjects.
* In today’s technology-driven world, it is more important than ever before to prepare students for the future.
* Teaching robots to young students throughout their schooling can increase their ability to be creative and innovative thinkers and more productive members of the society.
* By teaching our students the basics of robotics, we can open the whole new world to them and exciting opportunities that they would not have access otherwise.

**Requirement of funds**

* Introducing robotics into the curriculum is a bit costly affair for schools which are not in a position to spare funds for the purpose, but grants may be sought to fund such useful endeavors.
* There are some more affordable kits that are available to suit the school budget.

**K-12 Robotics Kits and other Programming Applications**

* Lego Mindstorms has a programmable graphic user interface that enables programming, but can be modified to use common languages instead, like ‘Java’ or ‘C’.
* In addition to Lego Mindstorms and ‘WeDo’, some of their other products, for early learners are also available.

**Robotic Providers**

* Wonder Workshops ‘Dash and Dot’ robots, are a big hit with elementary-aged learners. Wonder Workshop also offers a number of kid’s programming applications, such as ‘Blockly’, which has been effective in introducing programming in classrooms at the elementary level.
* ‘Blockly’ and ‘Scratch jr’ both are kid-friendly.
* There are so many other ‘programmable’ units available for use at different stages of curriculum, such as ‘Code.org’, ‘mama.codes’ ‘Sphero’.
* “Vex Robotics” are the popular robotics provider.
* There are so many other robotic providers in America which have been going strong for more than the quarter century. We can also have a beginning, if we desire so.

**Reasons to teach robotics in schools**

* An introduction to basic programming.
* Teaching of robotics increases creativity.
* To prepare them for future
* Teaching children how to turn frustration into innovation.
* Promoting inclusivity in order to avoid marginalization.

**An introduction to basic programming**

* Teaching programming computer is an excellent skill to begin with.
* But, the abstract subject of programming can be a challenging feat for young students. .
* Robotics is simpler to understand and more tangible introduction to programming.
* When students program physical robots, it’s easier to them to see what goes wrong as they learn what robots can and cannot do.
* They learn the skills needed to create precise and accurate instructions and fun while learning valuable lessons.
* Teaching robotics in schools gives students the opportunity to address the growing demand of teaching STEM subjects while learning how science, technology, engineering and math work together and interact.

**2. Increase Creativity**

* Robotics is a production-based learning module.
* Students have the opportunity to create something tangible and make it perform the action that they program it to do.
* Not a lot of fields combine creativity with engineering and technology—robotics does.
* When students are given the opportunity to create something interactive that they think is cool, their engagement level increases and they retain more information.
* We might be surprised to see at the things kids can create when given the right information and tools.

**3. Prepare them for future**

* To make students more likely to get a job in future and earn more money in their life-time.
* It is no secret that the jobs in the STEM field are the fastest growing careers, and are projected to grow further many folds in the next decade.
* Industries such as the **“drone industry”** have grown dramatically and rapidly in the last couple of years.
* It has been reported that 15,000 drones are being sold in the USA every month.
* Growing industries are going to need people, who can come up with new and innovative ideas, and equipped with the knowledge to designed and create the technology.
* When students are introduced to robotics in their school years, they can discover any interests and talents that they may have in this job market.
* Without the knowledge or access to the robotics education, there is no way for students to build interest in these fields.
* There are lots of potential creators and inventors in schools, especially public schools, who, if given a chance and resources may realize their potential.

**4. Teaching children how to turn frustration into innovation**

* Learning how to build and program a robot can be a complex and difficult process. Many students will struggle with the concept at first and often get frustrated.
* Robotics in schools can help these students turn their frustration into creativity and innovation.
* This is a valuable life lesson that teaches our students perseverance and determination when faced with challenges.
* Students learning robotics are able to channel their frustration into trying harder and aiming higher.
* All their hard work makes them feel sweeter, when they look at that finished product.
* Teaching robotics to students is to teach them how to persist and solve problems.
* It also helps them increase their maturity levels and prepare them for real world situations.

**5. Promoting inclusivity**

* Robotics is a field that is easily accessible to a wide range of students with varying talents and skills.
* Robotics is also a field that has the ability to empower the young girls in the classroom.
* STEM focused fields are traditionally male dominated, leaving young girls to question their ability to program or build computers.
* Because the tech world is not one that focuses on or is created for the girls, by engaging them with robotics and technology in the classroom we can begin to change that.
* When girls realize their ability to build robots and program, they are empowered to have successful futures and create innovative technology.

***By the time our students graduate in a few years or so, over half of the available jobs will be in STEM field and the large chunk of the rest will require employees to have some STEM knowledge. Robotics allows multiple points of access to Science, Technology, Engineering and Mathematics for students.***