Project: **Arduino! Bits, Bytes, and Beyond!**

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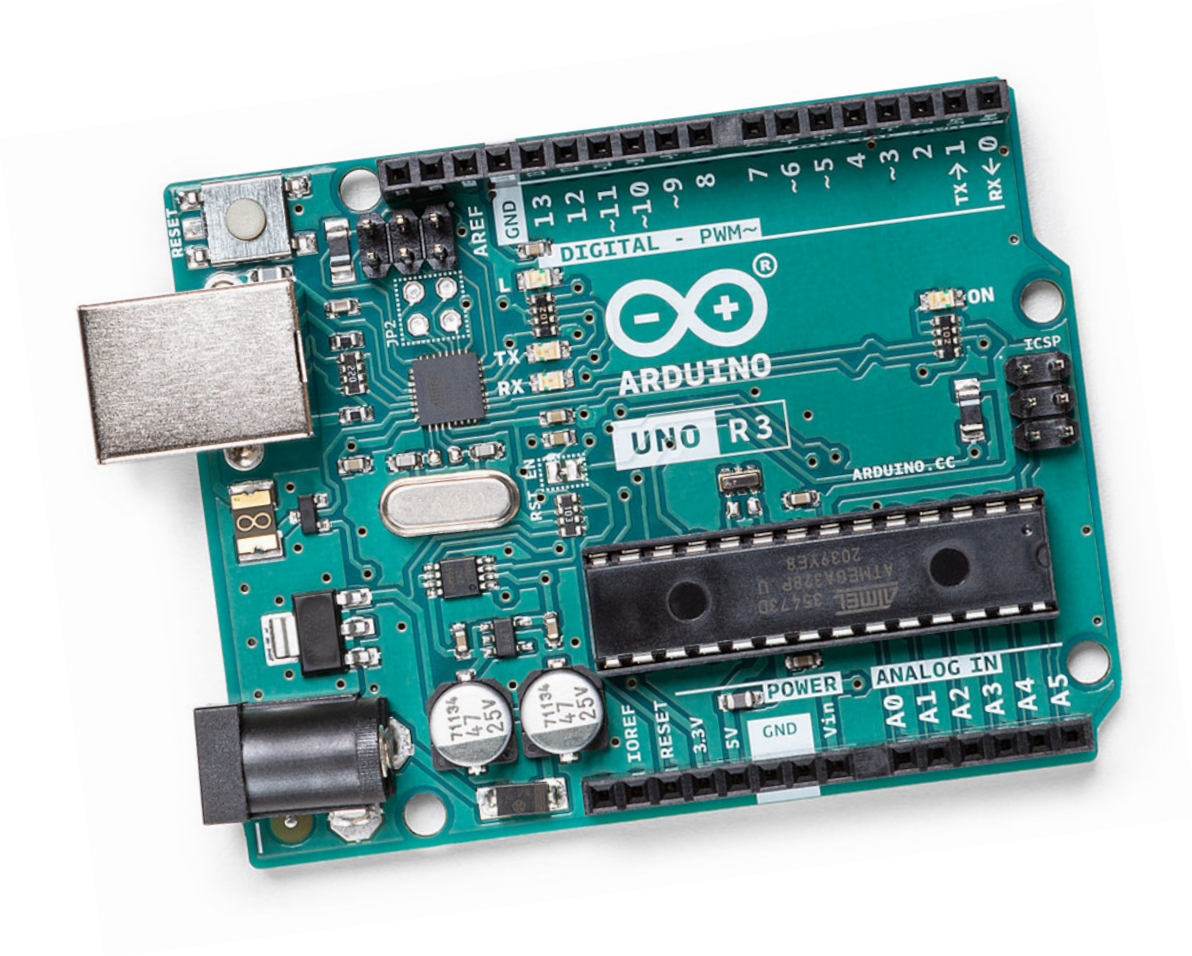

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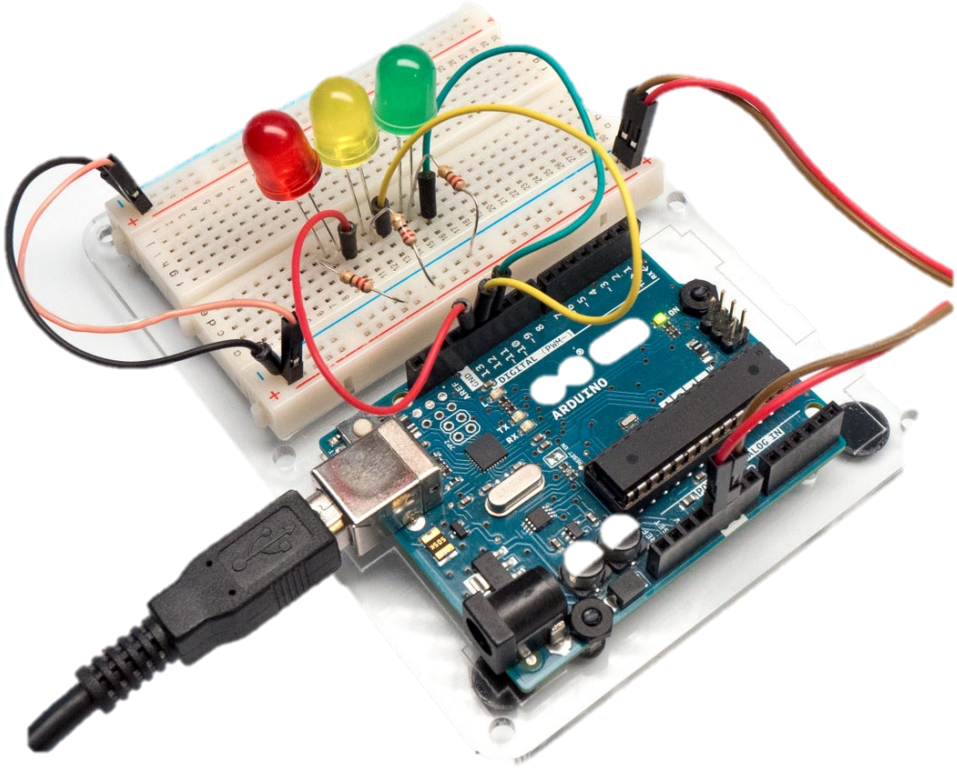


Table of Contents

Sample Florida Common Core/CTE Standards 2
Goals & Objectives 3
Project Overview 4
Step-By-Step Lesson Plan/Guide (For Teachers) 5
How-To Guide (For Students) 6
Project Scoring Rubric 7
Websites/Learning Ideas/Resources 8
Project Kit Resource Samples / Student Work Samples 9

Sample Florida Common Core/CTE Standards

08.02 Use career resources to develop an information base that reflects local and global business-related occupations and opportunities for continuing education and workplace experience.

08.04 Design, initiate, refine, and implement a plan to facilitate growth and skill development related to anticipated job requirements and career expectations.

08.06 Demonstrate an awareness of the potential impact of local and global trends on career plans and life goals.

LAFS.910.RI.4.1 & LAFS.910.SL.1.2

By the end of grade 9, read and comprehend literary nonfiction in the grades 9–10 text complexity band proficiently, with scaffolding as needed at the high end of the range.

By the end of grade 10, read and comprehend literary nonfiction at the high end of the grades 9–10 text complexity band independently and proficiently.

LAFS.1112.RI.4.1 & LAFS.1112.SL.1.2

By the end of grade 11, read and comprehend literary nonfiction in the grades 11–CCR text complexity band proficiently, with scaffolding as needed at the high end of the range.

By the end of grade 12, read and comprehend literary nonfiction at the high end of the grades 11–CCR text complexity band independently and proficiently.

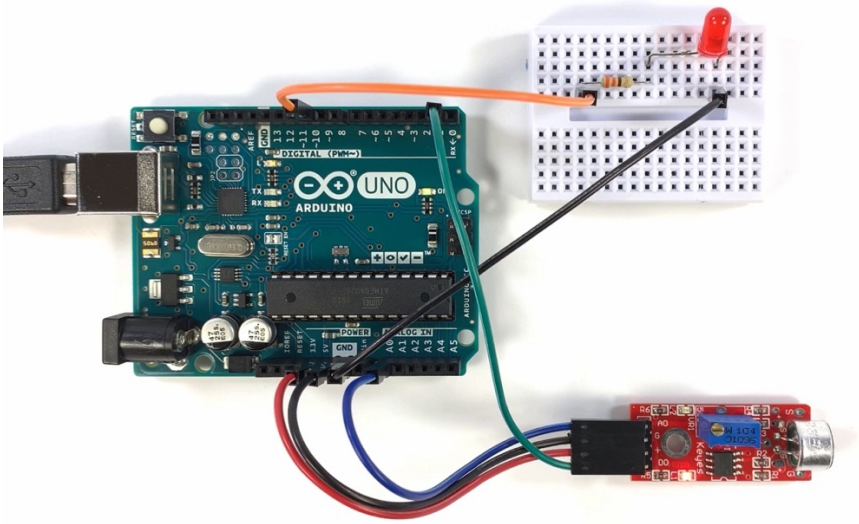
Disclaimer/Notation: *The above standards are specific to 9th, 10th, 11th, and 12th grades; however, this project meets standards for all grade levels (K-12) in reading/language arts, social studies, visual arts, and many other content areas that integrate to a STEAM initiative. A multitude of Common Core standards are easily met across the curriculum using the following plans and lesson ideas.*

Goals & Objectives

The goal of this project is to allow all levels of learners to experience and evolve their own understanding of simple circuits and computer programming. The project allows for multiple hands-on objectives, while allowing all types of learners the ability to feel comfortable with the Arduino device family.

The objective is to create multiple pathways for student success, all while students feel they have created their own goals and objectives. Many of the activities, assignments, and larger projects are open-ended, so is that students can take the result as far as they feel comfortable in doing. Teachers will have to opportunity to create key points of learners' mission goals, success, and overall completion, so that curriculum goals and standards are paramount.

As educators, we strive for our students to be prepared for the 'real world.' We want our students to prepared more so than anyone is at this moment. A growth mindset reinforces this day in and out. We can teach our students these strategies with fun and engaging methods. Imagine connecting students with a real-life lesson in careers and jobs in the tech world that are new, impact-driven, all while creating an experience that students will enjoy. Take all that and connect ground-breaking circuits and coding methods that are a growing part of the tech world and global career community. All this and much more will be achieved with through this project application!



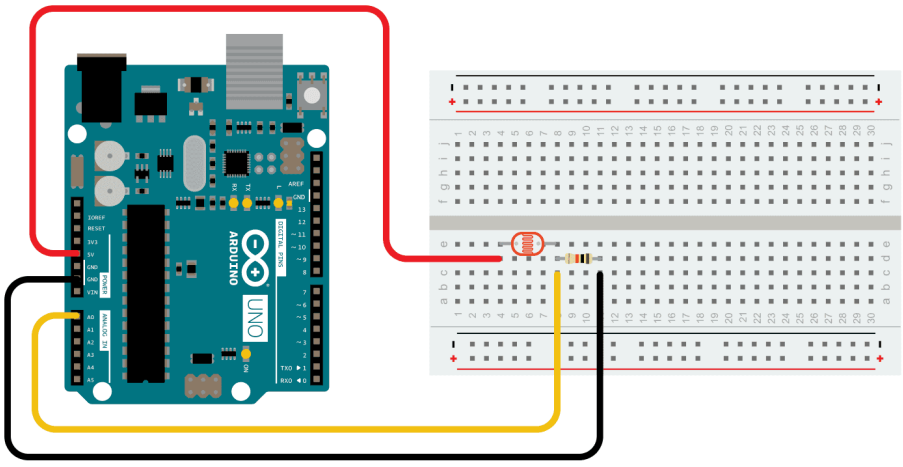
Project Overview

This project seeks to pique the interest of many students of all ages that may or may not yet have the curiosity of real working circuits or programming. Though the thought of wiring LEDS and servos (small motors) may sound daunting, the activity described in this overview is accessible for all levels and ages of learners.

While students may have not yet touched a circuit board, 'breadboard' or any of the physical hands-on devices required for this project, students surely can begin with the online, screen simulation that allows all learners to feel comfortable with 'connecting' the wires and turning on the circuits, well before they physically touch anything. This is a critical step for the students and teachers, so everyone can feel they can fully understand what will be required as they progress.

Once students have the comfort level with the simulation of the circuits and programmable board, they will then be prepared to physically connect and run their projects on a real-life working circuit board with motors, lights, and touch sensors. This overall reward and feedback once complete are huge; student success thrives on hands-on deliverables and the Arduino kit delivers on time.

Educators ask all the time about ability for students with different abilities, and how that will work in the lab setting as well as the general education class lab, and the true answer is that these activates work very well. Students with different abilities love hands-on interactive tools such as the Arduino, and educators will see huge learning gains and milestones being met and exceeded.

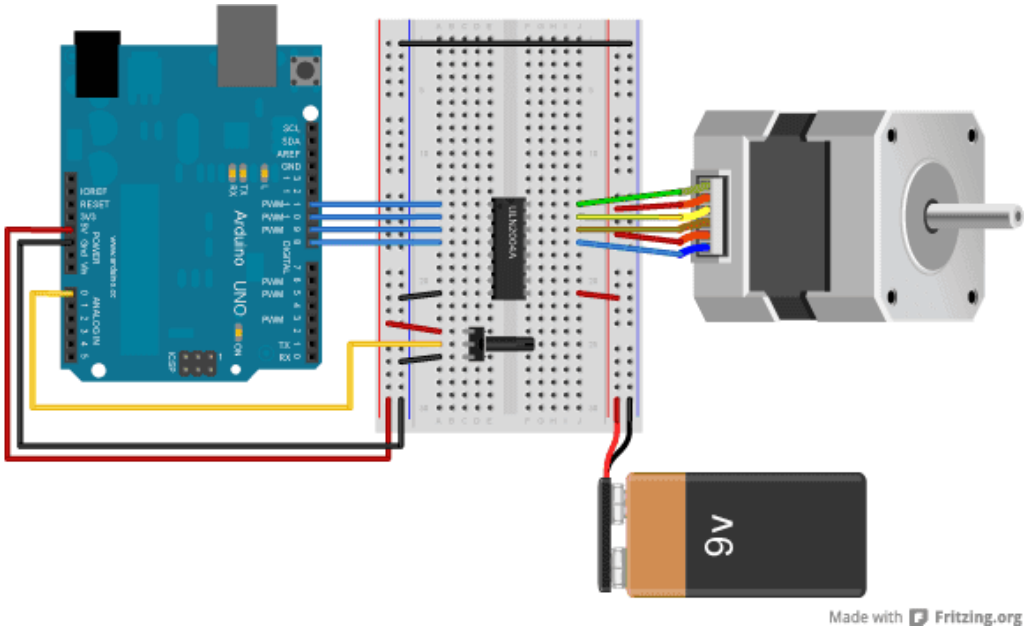


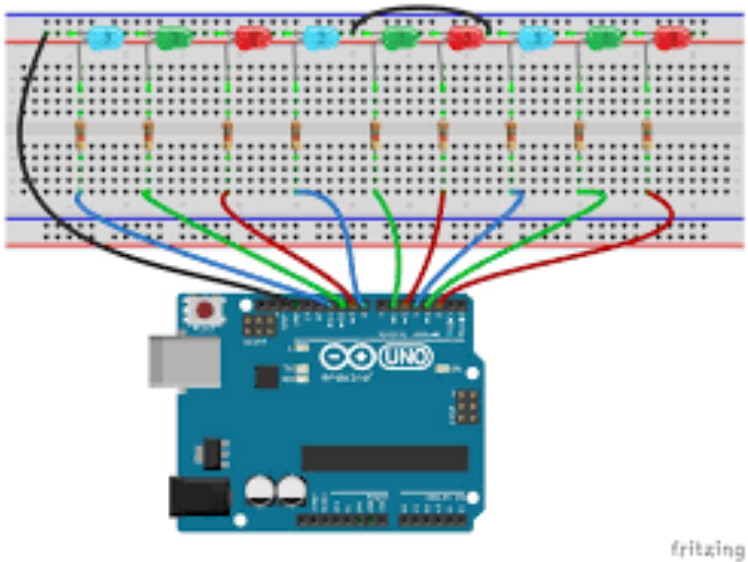
Step-By-Step Lesson Plan/Guide (For Teachers)

1) As educators, we can appreciate the fact that many of our students will grasp this activity with ease, while others will find this activity challenging. Just like any assignment, there are always over-achievers as well as those who will need a boost to start and complete.
2) We can also appreciate that some students will know more than the educator may know about the physical or virtual components of this system, how all parts operate, and how to configure options. Just as how some students become teacher-aids in the class, we will soon see student advocates within the lab setting that can help others – this is a power up!
3) On Day one (or one class period), unpack all Arduino kit components with your students/classes and see how many of the individual components' students know about or have any concerns or questions about. Sometimes the less a student may understand about a project like this the better, as this promotes further room for growth.
4) On day two (or one class period), once all students have seen and questioned components of the Arduino kits, it is now a great time to allow students to utilize the online simulation of the circuit board through the *TinkerCad* 'Circuits 'website. This is where students will be able to work in a safe '*sandbox'* environment where kits cannot be broken, and all ideas can be imagined and carried out. Students will also be able to download real life schematics to utilize during our next step.
5) On day three (or one class period), once students have seen the physical kits, and had an opportunity to work through the TinkerCad circuits website to 'create' their project in simulation, it is now time to physically make their project come to life. This will be a different timeframe for each student because each project and schematics will vary in many ways. This will also be an amazing growth opportunity for your students, as well as a chance for them to see each other in action, working with real-world circuit board applications such as LED light displays (traffic lights) any many other fun projects they can imagine. Students typically best follow one or more of many hundreds of online (YouTube) videos for help and step-by-step tutorials of exactly how to do each project! You as the teacher do NOT need to be an expert on circuits, Arduino, or any of this!
6) After students exhaust many activities, students will want to research and gain ideas to how this can be applied to their everyday lives; the sky is literally the limit! Students can write down ideas in a journal or document for your assignment/project submission as you want them to.
7) A final summary from each student could take place in small groups or individual presentations to showcase their findings and where their interests are. students may want to present a PowerPoint to the class or turn in an essay, or a small, short movie with photos. Possibilities are endless, and projects will be different.
8) A grading rubric to follow along the way has been provided for your aid that can be altered for your own individual needs and class setup.

How-To Guide (For Students)

(Students and teachers can follow the many videos from either the official YouTube channel, or the official Arduino Website (*Links below*). There are hundreds of folks online with amazing step-by-step guides and project ideas that will keep your students engaged for many class sessions!)





Sample Project Scoring Rubric

Category	Points Possible	Excellent (Above & Beyond)	Very Good (80%)	Good (70%)	Fair (65%)	Points Received
Coding Concept (*Students understand basics to coding*)	30	25-30 Points	20-24 Points	15-19 Points	0-14 Points	
Career Ideas (*Student researches and presents findings*)	30	25-30 Points	20-24 Points	15-19 Points	0-14 Points	
Arduino Parts Identification (*Student can identify Arduino Kit Parts*)	30	15-20 Points	10-14 Points	5-9 Points	0-4 Points	
Participation (*Time and effort well spent well all project tasks*)	10	15-20 Points	10-14 Points	5-9 Points	0-4 Points	
Total Possible:	**100**	**80-100**	**60-79**	**40-59**	**0-39**	
Grade Equivalent:	**A+**	**A**	**B**	**C**	**D**	

Websites/Learning Ideas/Resources

https://www.amazon.com/SunFounder-Mega2560-Starter-Kit-Compatible/dp/B087BFP3JN/ref=sr_1_3?keywords=sunfounder%2Barduino%2Bkit&qid=1686618108&sprefix=arduino%2Bsunf%2Caps%2C114&sr=8-3&th=1
Amazon.com Arduino $60 kit (*as of June 12th, 2023*)

https://www.arduino.cc/en/about
What Is Arduino?

https://www.youtube.com/results?search_query=arduino+led+display
Arduino LED light display YouTube Tutorials.

https://www.arduino.cc/en/Guide
Getting started with Arduino for everyone.

https://www.careeronestop.org/ExploreCareers/Assessments/interests.aspx
(Career exploration site which includes a 'career exploration' survey/assessment for all ages; to help determine where in the IT/STEAM world interests may be.)

https://education.minecraft.net/
(Almost every student has heard of or played this game, and most MDCPS machines have the software installed! There are coding and build CHALLENENGES, and real assignments your students will love.)

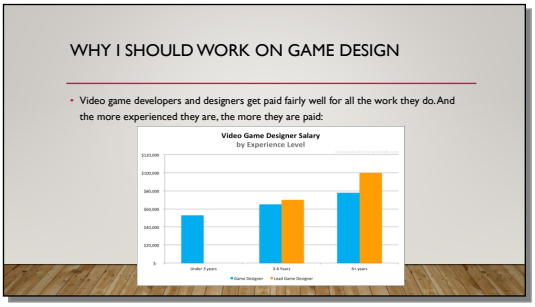
https://www.w3schools.com/cpp/default.asp
(Learn C++! You and your students can do it with easy-to-follow steps!)

http://compute-it.toxicode.fr/
(A colorful take on understanding coding from a different type of perspective!)

https://www.khanacademy.org/computing/hour-of-code/hour-of-code-lessons/hour-of-drawing-code/pp/project-self-portrait
(Student can create ART by using JAVA with Khan Academy's easy to use and script interface! Fantastic for all ages and levels!)

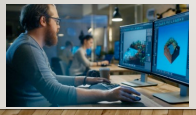
http://earsketch.gatech.edu/landing/#/
(Music and coding come together with this amazing resource from Georgia Technical Institute of Technology!)

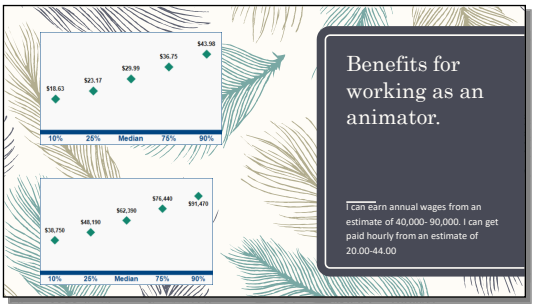
Project Kit Resource Samples / Student Work Samples



WHY I'M INTERESTED IN GAME DESIGN

- I love playing video games since I was a child. I was always fascinated by the creation a video games most people know and love, like Super Mario, Sonic and Call of Duty. Video game design allows me to express my idea with making video games. I want to see a game I help create gain fame and popularity where lots and lots of people play it.





Benefits for working as an animator.

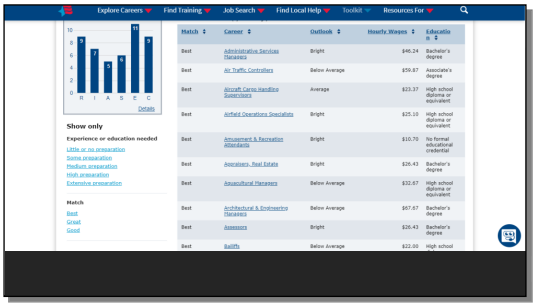
I can earn annual wages from an estimate of 40,000- 90,000. I can get paid hourly from an estimate of 20.00-44.00

You should hire me because of my knowledge of computers and engineering

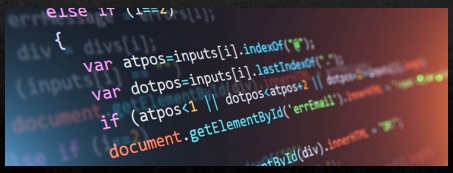
WHAT ELECTRICAL AND ELECTRONICS ENGINEERS DO

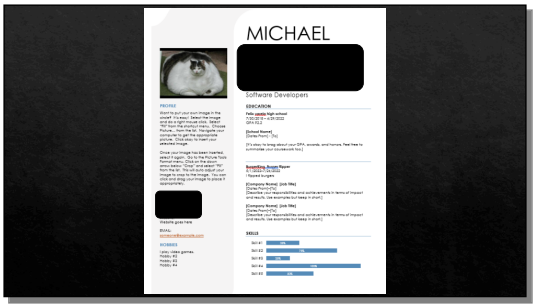
Electrical engineers design, develop, test, and supervise the manufacture of electrical equipment, such as electric motors, radar and navigation systems, communications systems, or power generation equipment. Electrical engineers also design the electrical systems of automobiles and aircraft.

Electronics engineers design and develop electronic equipment, including broadcast and communications systems, such as portable music players and Global Positioning System (GPS) devices. Many also work in areas closely related to computer hardware.

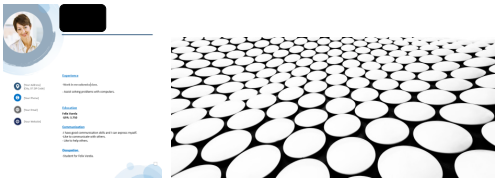


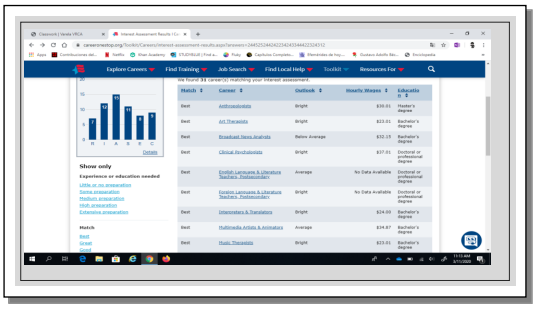
A software developer is a person who creates computer software.

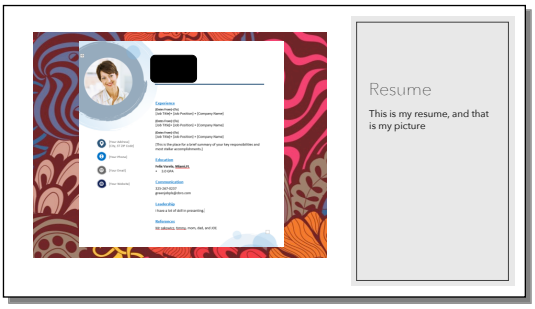


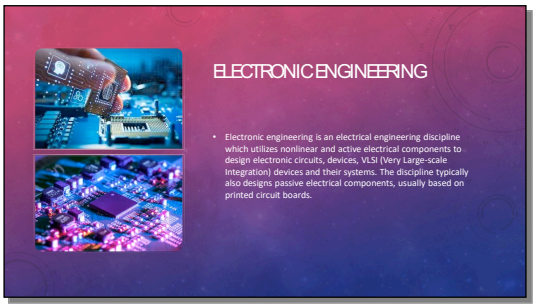


ELECTRICAL AND ELECTRONICS ENGINEERS









Arduino Mission

Arduino's mission is to enable anyone to enhance their lives through accessible electronics and digital technologies. There was once a barrier between the electronics, design, and programming world and the rest of the world. Arduino has broken down that barrier.

Over the years, our products have been the brains behind thousands of projects, from everyday objects to complex scientific instruments. A worldwide community, comprising students, hobbyists, artists, programmers, and professionals, has gathered around this open-source platform, their contributions adding up to an incredible amount of accessible knowledge.

Our vision is to make Arduino available to everyone, whether you are a student, maker or professional, which is why we now have three segments to our business. These segments work together as an ecosystem with a shared mindset: we started with Maker, and that has evolved into Education and PRO solutions.

Arduino Maker

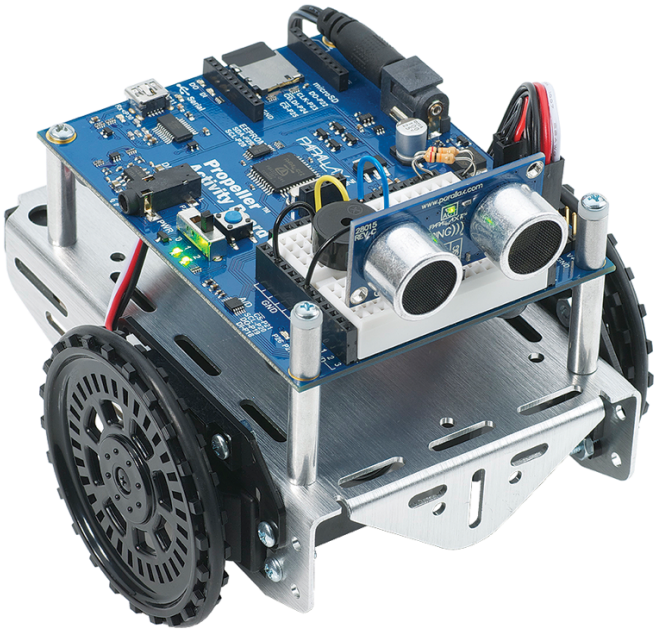
Find creative solutions to everyday challenges.

For makers around the world, our goal is to democratize the most advanced technologies and create a new set of opportunities for creative people, whether that's through connected products, advanced sensors, Cloud & Apps, machine learning, AI, etc.

Arduino empowers creative minds to master technology and intuitively solve everyday problems. Our platform simplifies the use of otherwise complex tools. For example, programming a securely connected IoT device is just a few clicks away with the use of the Arduino Cloud.

About Arduino

Arduino designs, manufactures, and supports electronic devices and software, allowing people around the world to easily access advanced technologies that interact with the physical world. Our products are straightforward, simple, and powerful, ready to satisfy users' needs from students to makers and all the way to professional developers.

Visit: www.arduino.com
LinkedIn | Facebook | Twitter

References/Credits: All Arduino components, images, likeness, and lessons have been approved for use for this dissemination presentation with expressed consent by Arduino.