Self-Driving Cars STEM Unit

Close reading resources

Focus Question: What are some of the advantages and disadvantages of self-driving cars?

Week 1

Video 1 - Source: Youtube
https://www.youtube.com/watch?v=EYh0F_8ZdSU
Title: Inside Uber's self driving car

Article 1 - Source: Achieve3000
Title: Hands off the car driving

No lesson plan or close reading template needed for this article. Use this time/day for complete the Achieve3000 work.

Article 2: Source: Wonderopolis

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Can a Car Drive Itself?

Do you look forward to the day when you can slip the key into the ignition, press down on the accelerator, and zoom down the highway in your own car? As kids get older, many of them begin to count down the days until they get their driver's licenses.

As anyone who has ever driven a car knows, there's a certain amount of satisfaction and enjoyment you get from driving a car. On a sunny day, it can be pleasant to zip down the highway with your favorite tunes playing and the wind in your hair.
If you're in grade school right now, though, will things look different by the time you're old enough to get your driver's license? What if cars are driving themselves by the time you're old enough to drive?

Does this sound like far-fetched science fiction? Maybe it is…or maybe it isn't! Ever since automobiles were invented, scientists and manufacturers have searched for ways to make them easier to drive and more automated.

The earliest advancements in automobile automation date back to the 1920s and 1930s. Cruise control, which allows an automobile to maintain a set speed without human input, has been around since the 1940s.

Completely self-driving (or driverless or uncrewed or autonomous) cars, however, had to wait until technology caught up to the dreams of early automobile scientists. The first such cars appeared as early as the 1980s thanks to the work of scientists at Carnegie Mellon University. With modern technology, such as wireless Internet, Global Positioning System (GPS) satellites, digital maps, and advanced computers capable of quickly processing radar and lidar signals, self-driving cars are now closer than they've ever been. Technology giant Google and electric automobile manufacturer Tesla are currently working on advanced prototypes of cars that will do the driving while you sit back and enjoy the ride.

As these vehicles navigate city streets, they follow digital maps while advanced sensors communicate necessary information about the environment, traffic, and road hazards. They stop, go, and get you to your destination without human input.

The potential benefits of self-driving cars are many. Can you imagine how much easier commuting would be if you could sit back and read a book while your car drove you to work? Self-driving cars would also be a tremendous asset to people who are blind or have vision impairment and to the elderly who are no longer able to drive safely. And speaking of safety, experts estimate that self-driving cars would greatly reduce the number of accidents, the overwhelming majority of which are caused by human error.

So will we be seeing self-driving cars all over the road in the next few years? Probably not. While there are still some technological hurdles to jump, the primary obstacles are regulatory. Self-driving cars will require many new laws to set up a framework for a new world in which cars are driving themselves. For example, who would be liable if two self-driving cars were involved in an accident?

Another potential drawback of self-driving cars is their cost. As with any type of new technology, the first models for sale will likely be quite expensive. Another issue manufacturers will have to deal with is whether or not drivers really want to give up control. While some people might enjoy sitting back and reading while being driven to work, others truly enjoy the excitement of driving a car

Video 2: Source: Wonderopolis:

Title: Today's Wonder of the Day was inspired by Lance from, Lance Wonders, "How does a google self driving car work?" Thanks for WONDERing with us, Lance!

http://wonderopolis.org/wonder/can-a-car-drive-itself

Week 2 Articles

Video 3: Source: TEDEd lessons worth sharing http://ed.ted.com/lessons/the-ethical-dilemma-of-self-driving-cars-patrick-lin#watch
Title: The ethical dilemma of self-driving cars - Patrick Lin

Article 2: Source: Auto Insurance Center
http://www.autoinsurancecenter.com/top-20-pros-and-cons-associated-with-self-driving-cars.htm
Title: Top 20 Pros and Cons Associated With Self-Driving Cars

If there's one topic that gets a lot of attention lately in the media, the public policy sphere, and in general health and wellness discussions, it is how to make the roadways safer.

According to the Centers for Disease Control, fatalities from traffic incidents happen on an annual basis upwards of 33,000 people. Many of these accidents are preventable, and an alarming number of them are a result of distracted driving.

In the past few years, as a result of the number of traffic accidents plaguing the country and the devastating injuries and fatalities that result from them, a greater push has been made in the sphere of technology to make cars safer, drivers more aware, and accidents less likely.

Alongside other technology that has emerged during this time is the idea of self-driving cars, an advancement that seems like it belongs in a futuristic movie.

The reality is that self-driving cars aren't that far off, actually, but the debate over whether they increase or decrease safety rages on.

Drivers At-Fault for Most Accidents
While surely some faulty mechanics can be cited as the cause for certain accidents, more often than not drivers themselves are the most dangerous things about hitting the open road. The reality is that there are so many factors at play when a driver gets behind the wheel and a safe road experience relies on a driver that is 100 percent focused on the road.

Google's director of the self-driving car program, Chris Urmson, says the company's vehicles are better all around: "They are more courteous and more defensive drivers than normal drivers."

Most people are aware of how to drive safely. Whether it is tips they picked up from driver's education or learned behind the wheel while a parent guided them through driving maneuvers, many people start out with a heightened awareness and desire for safety behind the wheel.

CHECK OUT: How to Find Affordable Car Insurance

Over time, however, it's easy to be lulled into a sense of false confidence that makes a driver think that he or she is paying "enough" attention to get by.

Speeding, being distracted by happenings inside the car or outside, failing to follow road laws, or driving while tired, drunk, or under the influence of drugs can all be extremely dangerous. Adding just one of these factors to the mix dramatically increases the chances that an accident will happen. While all of these factors are unlikely to be controlled every time a driver turns the ignition key, the same is not necessarily true for self-driving cars.

Right now, self-driving cars can only be tested in Washington, D.C., Nevada, Florida, Michigan, and California. There is certainly a lot of interest into what extent they might influence transportation, but research and testing are still ongoing.

Pros: Self-Driving Cars

1. In comparison to the myriad of bad behaviors a driver might exhibit behind the wheel, a computer is actually an ideal motorist. Since 81 percent of car crashes are the result of human error, computers would take a lot of danger out of the equation entirely.

2. Computers use complicated algorithms to determine appropriate stopping distance, distance from another vehicle and other data that decreases the chances of car accidents dramatically

3. There are no opportunities for a computer to be "distracted", which is a leading cause of accidents in the United States at present.

4. Although it's not clear to what extent lives would be saved, it's obvious that human driven cars come at a very high cost in terms of danger.

5. The U.S. Department of Transportation actually assigns a value to each human life: $9.2 million. Therefore, there would be a significant cost savings in many different venues like insurance costs and healthcare costs associated with accident recovery alone.

6. As an article from Forbes points out, there is also a cost savings associated with time. When a computer takes over the driving responsibilities, drivers can use that time to do other things, like catch up on reading or chat with passengers, all without having to worry too much about road safety.

7. According to Eno Transportation, self-driving cars in large number participate in a behavior known as platooning, which would significantly improve traffic conditions and congestion. This would help to reduce commute times for drivers in high-traffic areas but also to maximize on gasoline usage.

8. In order for the cars to operate most efficiently, they'd need to communicate with one another, helping to identify traffic problems or road risks early on.

9. Disabled individuals, who have to rely on public transportation or assistance from others to get around, could reap the benefits of self-driving cars with new freedom and enhanced mobility, as suggested by the New York Times.

10. Larger cities are plagued with the problem of providing adequate public transportation. Many have a lack of appropriate infrastructure to support the needs of their residents, a void that could partially be filled by self-driving cars.

11. Over time, higher speed limits might be considered as an option if more people are using self-driving cars. Since the computers calculate operation of the vehicle safely, driving time could be reduced by faster speeds allowed on the road.

12. Companies are always interested in new product development and taking the industry forward by a step, as indicated by the seven companies who requested permits for self-driving car development in California alone.

13. Many cars are already equipped with features in the first stage of "automatic" driving, like autonomous braking, self-parking, or sensors that clue a driver in to a nearby obstacle.

14. Drunk driving incidents should decrease, because there's no designated driver needed when the car drives itself.

15. Massive savings could be recouped from being spent on older mass transit projects like trains.

16. Police officer focus could be shifted from writing traffic tickets and handling accidents to managing other, more serious crimes.

17. Sensors in the autonomous cars allow vehicles to ride closer together, therefore allowing more cars on the road with actually less traffic.

18. Less parking structures and parking headaches would be required, since your car could actually drop you off and locate a parking space farther away.

19. The line at the DMV would be cut short since people wouldn't need a specialized driving license to operate cars.

20. There is a less of a concern about taking the keys away from Grandma when she gets too old to drive carefully- the car will take care of her!

Cons: Self-Driving Cars

1. Just having the ability to operate a self-driving car would require an education on the driver's part, according to Teletrac. While the computer takes over once the vehicle is operational, the driver would still be required to maintain some knowledge about how to operate it safely.

2. The cost of implementing the new technology could be way out of reach for most Americans. Currently, the engineering, power and computer requirements, software, and sensors add up to more than $100,000.

3. The most savings in terms of cost, time, and lives is going to come from when more people "opt in" to the service. If self-driving cars are not adopted widely, accidents can and will still happen.

4. The very security behind self-driving cars would be a major obstacle, especially because the technology would be of very high interest to hackers, as pointed out by the Guardian.

5. In order for a computer to operate a vehicle, a lot of information would have to be stored on the software. Some individuals are concerned about the opportunity for a computer built into the self-driving car to collect personal data.

6. Even though there are concerns about the adequate nature of public transportation, self-driving cars would eliminate many jobs in the transportation sector, especially when it comes to freight transportation and taxi drivers. This could have a negative impact on the unemployment rate and the economy.

7. A self-driving car doesn't completely eliminate the likelihood of a car accident. In fact, there's no legal precedent for how a case would be handled. The difficult question of who holds responsibility in a car accident- the driver? The car manufacturer? The software developer? Could be tricky to answer.

8. The cars are not able to operate at a high level of safety in all weather conditions. In fact, heavy rain can do serious damage to the laser sensor mounted on the car's roof, calling into question what role the driver might have to play in the event the technology fails.

9. If other technology fails, such as traffic signals that the cars rely on, there's no accounting for human traffic signals. In the event of an accident, for example, where a police officer is directing traffic, the cars cannot interpret human signals.

ALSO: Should You Replace a Car Seat After a Crash?

10. The reliance on technology could mean that over time, drivers are no longer equipped with the skills to operate cars. In the event of a technology glitch or recall, drivers might be helpless to get around, having been "out of practice" in the driving world for some time.

11. Full development of self-driving cars still raises a lot of questions and concerns on behalf of drivers, so it's unclear how full adoption of the technology might be.

12. Many individuals are nervous about handing over all the power to a computer, which could malfunction and put the driver in a more dangerous situation than if the driver were manning the vehicle himself or herself.

13. It's unclear how self-driving cars would maneuver through hazards like roadblocks or unique local driving laws. A good example is the difference between states regarding turning right on red. The computers could have difficulty identifying the different local and state rules with regard to the road.

14. The success of self-driving cars currently relies on accurate mapping systems through GPS. As anyone who has been advised to turn down a one-way street or been told by their GPS they were driving on a non-existent street can attest, GPS devices are not always accurate. There are security concerns about self-driving cars, too. Director of research for infotainment and advanced driver assistance systems at the research group known as IHS Automotive, Egil Juliussen, says that "Electronics systems in cars currently have no or very limited security measures."

15. The NHTSA remains skeptical of the technology behind self-driving cars, even calling for a ban on them at one point until further testing could be completed.

16. Since Google is currently at the helm of development for the cars, other auto manufacturers might sell fewer cars in the event that Google's version takes off.

17. The gasoline industry is likely to suffer because, taking the note of "new and improved" it's likely that the self-driving cars would be electric.

18. Personal injury lawyers may see a reduction in their earnings if self-driving cars truly are safer and reduce the number of accidents on the road.

19. Driver's ed courses would lose money and go out of business because there would be less of a need to educate people how to drive.

20. People who enjoy driving are unlikely to buy into the technology that means they no longer need to focus behind the wheel, so they are likely to keep their own vehicles rather than trading in for a self-driving vehicle.

As this brief article shows, there's a lot of promise and opportunity associated with self-driving cars, but there are also a lot of questions and concerns. The technology is still being developed and tested, so workarounds for some of the above-mentioned problems might be created as of yet, but the system is not perfect at present.

Self-driving cars may be a part of the future, but if they are successfully deployed across America's roadways, it will be a revolution not just for drivers and traffic patterns, but also for the transportation industry as a whole.

Article 3: Source: NewsELA - able to get stories at different lexiles
https://newsela.com/articles/self-driving-cars-laws-fed/id/21898/
Title: Government paves the way for self-driving cars

WASHINGTON, D.C. — Obama administration officials are beginning to introduce guidelines for safely bringing self-driving cars to the nation's roads. The goal is to avoid creating so many obstacles that the technology can't get to people quickly.

Automakers and tech companies have been testing self-driving models on roads for several years, with a human in the driver's seat just in case. The results suggest that what once seemed like distant technology could be fast approaching.

Safely Harnessing Technology For Good

Federal officials have struggled with how to gain the technology's promised safety benefits while making sure the cars are ready for broad use. A benefit is that the cars can react faster than people, and they don't drink alcohol or get distracted. Officials hope the new guidelines will bring order to what has been a chaotic rollout so far.

President Barack Obama wrote about the hopes for self-driving cars in an opinion piece in the Pittsburgh Post-Gazette. Such cars might save thousands of lives on U.S. roads each year and change the lives of the elderly and the disabled, he said.

"Less congested, less polluted roads. That's what harnessing technology for good can look like," Obama wrote. But he added: "We have to get it right. Americans deserve to know they'll be safe today even as we develop and deploy the technologies of tomorrow."

Embracing The Future

One self-driving expert said the tone of the guidelines signaled that the federal government has embraced autonomous, or automated, driving. "In terms of just attitude, this is huge," said Bryant Walker Smith, a law professor at the University of South Carolina who tracks the technology. He cautioned that many details remain unclear.

The government did make clear that the National Highway Traffic Safety Administration (NHTSA) will seek recalls if needed. Recalls require car makers to fix or upgrade cars they have sold. They can be costly for manufacturers. The government expects partially-autonomous systems to make driver-passengers pay attention.

The agency, which is part of the transportation department, released guidelines showing how NHTSA can use recalls to regulate technology. Semi-autonomous driving systems must account for distracted driver-occupants who do not take control of the vehicle in an emergency, the department said. Otherwise, it may be defined as too risky and subject to recall.

Learning From The Tesla Crash

NHTSA says the guidelines aren't aimed at electric car maker Tesla Motors. But the bulletin would address events like a fatal crash in Florida that occurred while a Tesla car was using the company's Autopilot system. The system can brake when it spots obstacles and keep cars in their lanes. But it failed to spot a crossing tractor-trailer and neither the system nor the driver braked. Autopilot allows drivers to take their hands off the steering wheel for short periods.

Tesla has since announced modifications so Autopilot relies more on radar and less on cameras, which it said were blinded by sunlight in the Florida crash. The company has maintained that Autopilot is a driver-assist system. Tesla said it warns drivers they must be ready to take over at any time.

Federal Responsibility, Not A State's

Officials said federal regulators, rather than states, should be in charge of self-driving cars. Their reasoning is that the vehicles are essentially controlled by software, not people.

States have set the rules for licensing drivers. However, when the driver becomes a computer, "we intend to occupy the field," Transportation Secretary Anthony Foxx said. States should stick to registering the cars and dealing with questions of responsibility when they crash, he said.

Automakers should also be allowed to formally confirm the safety of their autonomous vehicles by following a checklist, said officials. They should be able to do this on their own. Though companies are not required to follow the checklist — it is voluntary — Foxx said he expects compliance.

It's in their interest to meet the standards to gain the confidence of regulators and the public, Foxx said.

However, officials also said the NHTSA is examining whether it should have the authority to approve whether the vehicles are safe before they are sold. The government would inspect and approve technologies like autonomous vehicles. That would be a change from the agency's self-check system and might require action from lawmakers.

Officials spoke to reporters ahead of a news conference set for Tuesday. There, they plan to provide more details.

NHTSA has been striving to make the guidelines a brief framework, rather than a lengthy set of standards and regulations. The agency's administrator, Mark Rosekind, has said he wants the guidelines to be adjustable to keep up with the changing technology.

Keeping Up With Changing Tech

Some safety supporters have argued against voluntary guidelines. They prefer safety laws. But the rule-making process can take years to complete.

Automakers sought the NHTSA guidelines in part because they fear a patchwork of state laws will slow or complicate selling self-driving cars. Some state lawmakers see the rise of autonomous cars as a way to attract technology companies and spur economic growth. They are proposing laws friendly to the technology.

Michigan is considering bills that would allow the testing of self-driving cars without brakes or pedals on state roads. New York, on the other hand, has a law that requires drivers to keep one hand on the wheel at all times. The old law would not work with new self-driving technology.

Article 4: Source: NewsELA - able to get stories at different lexiles

https://newsela.com/articles/procon-self-driving-cars-future/id/21480/

Title: Is the idea of driverless cars gaining popularity?

PRO: Driverless cars could allow Americans to live where they want, without worrying about their commute to work

Technological advances are having a major effect on the way people live their lives. The changes are coming faster than at any time in human history.

Just 30 years ago, few could imagine having one's very own pocket-sized supercomputer — one that allows you to do virtually anything, from finding a date to buying a house. Yet today's smartphone is here and used by nearly everyone.

Now, the driverless car is another society-shifting invention that may become part of everyday life in the not-so-distant future.

Car Companies And State Governments Are Gearing Up

Carmakers like Volkswagen and General Motors say they will begin selling driverless cars in just three or four years.

State governments have already started preparing for the new technology's arrival.

California, Florida, Michigan and Nevada have recently passed laws governing their use. More than a dozen other states are considering similar legislation.

Many industry experts predict driverless cars will reduce private car ownership.

No longer will people be forced to spend thousands of dollars on a new car. Instead, when they need to get somewhere they will open an app on a computer or smartphone and call for a driverless taxi.

Suburban Life Is Preferred

Driverless cars may radically change the way people travel to and from work. Most likely they will also alter where and how people live.

In recent years, more and more people in the U.S. have been moving to big cities. However, groups have been sending out surveys which show that people of all ages still prefer to live in suburbs, because they are more affordable, convenient and spacious.

One 2015 poll showed that as many as two-thirds of young people would choose suburban living over life in the city.

If Americans still prefer the suburbs over city centers, why are so many choosing to live in cities?

Cities Hold The Best Jobs

There are a number of reasons for the shift from suburbs to cities. One of the most important is that many of the most desirable new jobs are in the tech industry, and many tech companies are located in big cities.

People who want to work in tech often need to be close to the action.

However, this does not mean that cities typically offer a better quality of life. In most cases, they do not.

Taxes are highest in some of the country's major cities, such as Chicago, New York, San Francisco and Seattle. Crime and pollution remain significantly worse in cities as well.

Commuting Will Become Easy

Driverless cars could completely change the way Americans think about where they live. Traveling from suburb to city center will become much less tiring, as people will no longer have to do the driving themselves. Because of that, people will feel less need to live where they work. They will no longer be forced to pay the high rents, taxes and fees common in big cities in order to work comfortably in those places.

With driverless cars, driving to work will be a breeze. Instead of being an exhausting trek, it will feel more like sitting at home on the couch watching a favorite television show.

If that is what the future looks like, most of us will not mind the extra travel time.

Justin Haskins is the executive editor of Heartland Institute, a conservative and libertarian public policy think tank.

CON: Driverless cars will bring about major safety and legal issues

A nationwide network of millions of self-driving cars whisking suburban commuters to work is a pleasant vision. However, getting to that point is far from simple.

Self-driving cars have been in development for years. Their backers claim the vehicles will be ready to take over the car market in the near future.

Having millions use these vehicles will improve highway safety, they claim. Driverless cars will make even the far suburbs more convenient places to live, they say.

However, before those suburban dwellers can order such cars, some gigantic problems must be overcome.

The Technology Is Not Safe

First, the technology used in those cars creates serious safety problems. Huge improvements must be made before they can safely handle streets.

Driverless cars rely primarily on pre-programmed information about routes. If something on the road changes, they are lost. For example, they would not obey a short-term stop sign. They also

have problems figuring out when objects such as bits of paper garbage are harmless, so they can change course abruptly for no reason.

The vehicles simply cannot deal with the unexpected adventures that fill everyday life. Until the cars can self-drive at all times, humans are going to have to be ready to take over at a moment's notice.

Human Error Causes Problems

Meanwhile, Google's self-driving car has already run into another perplexing safety problem: human drivers.

Recently, one of Google's self-driving cars came to a crosswalk and did what it was supposed to do: It slowed down to allow someone on foot to cross the street. However, the human "safety driver" panicked and hit the brakes. No one was hurt, but Google's car was hit from behind by another car.

Driverless cars cannot work properly unless detailed road maps have been loaded into the computers that guide them. Currently, the maps for Google's self-driving cars have only been designed to handle a few thousand miles of road. Developing a nationwide self-driving car system would require countless amounts of effort and money. Car companies would need to maintain and update information on millions of miles of roads.

Regulation Roadblocks

The development of driverless vehicles would also mean more state and federal regulation. There would be all sorts of new rules covering how, when and where driverless cars can be used. Most likely, all those new rules would significantly slow the spread of driverless cars.

The use of driverless cars would also raise issues of legal responsibility. For example, who should be held responsible in the event of a crash — the passenger, the carmaker or the designer of the computer system? Such complicated legal issues could take years and many lawyers to sort out.

Paying The Price

Totally self-driving cars will likely not be cheap, either. One report says making a car completely self-driving would add some $10,000 to its price.

There is also the problem of getting people to accept them. Cars are not just transportation — they also reflect our personalities and tastes.

Imagine someone who loves driving, who enjoys zooming down the highway in a sleek sports car. It will be hard to get them to accept simply being a passenger in a not-very-exciting computer-controlled vehicle.

Video 4: Source: The Washington Post

https://www.washingtonpost.com/news/the-switch/wp/2016/08/15/driverless-cars-the-pros-and-cons/?utm_term=.75089bcbfa64

Title: Driverless cars: The pros and cons

Summary: Driverless car technology can seem both exciting and scary, all at the same time. Should you trust a vehicle that makes its own decisions? How might driver automation cut down on traffic and wasted commuting time? In a short video, learn about some of the trade-offs associated with self-driving cars and how they stand to affect us all.

Week 3 Articles

Article 5: Source: Achieve3000

Title: Sooner that you think

No lesson plan or close reading template needed for this article. Use this time/day for complete the Achieve3000 work.

Article 6: Source: NewsELA - able to get stories at different lexiles

Title: PRO/CON: Self-driving cars are just around the corner. Is it a good thing?

(Example: Lexile 770)

PRO: In many ways, self-driving cars are already here

Americans are more than ready for a car that drives itself. In fact, we have been ready for more than 100 years.

Before we had cars, we had horses that pulled buggies. The horses did not need anyone to drive them. They were able to find their way home with little or no help from humans. Traveling without a driver is not a new idea. It is simply a better way to travel.

Cars first appeared in the early 1900s. As more people began driving, the amount of car accidents went up. Modern technology has made driving safer, but too many people still get hurt in car accidents.

Too Many Car Crashes

One study found that more than 32,000 people die each year in car accidents in the United States. Another 2.5 million people are hurt in accidents each year.

Almost 95 out of every 100 of these accidents are caused by human mistakes. That figure comes from the National Highway Traffic Safety Administration (NHTSA). This government agency works to make America's roads safe.

We accept all of these accidents because cars are very useful. Self-driving cars are even more useful. Self-driving cars allow people to do other things instead of driving. People could text on their phones, work or just relax.

Self-driving cars use many forms of technology to drive themselves. Radar, cameras and other sensors help the car "see" the world around it. Computers drive the car from one place to another. People do not drive at all. These cars should soon be ready for everyday use.

Self-driving cars remove many of the human mistakes that cause accidents.They also help people who cannot drive themselves get from place to place.

Ready Or Not, Here They Come

Then there is the fact that cars are expensive to buy. The gas that fuels cars is expensive too. People also have to buy insurance to protect themselves. A good insurance plan might pay for all the damage caused by an accident. Insurance can cost hundreds of dollars each month. That cost that would be lower with self-driving cars.

In some ways self-driving cars are already here. Some of the newest safety improvements in cars come very close to self-driving. New technology can control a car's speed and keep it in its lane. Technology can also help with parking. These are all steps toward a future full of self-driving cars.

Of course, self-driving cars will not be perfect. There will still be a few accidents. There will be some people who will never give up driving their cars themselves. Other people will live in areas where self-driving cars simply may not work.

Self-driving cars help people in so many ways. It makes little difference if Americans are ready for them. Ready or not, self-driving cars will soon be here.

ABOUT THE WRITER: Robert W. Peterson is a teacher at Santa Clara University School of Law. He also writes and teaches about self-driving cars. Readers may write him at Santa Clara University of Law, Santa Clara, CA 95053.

CON: No one likes a backseat driver, or backseat computer

No one likes backseat drivers. Backseat drivers sit in the back seat of a car and question everything a driver does in the front seat. Backseat drivers try to control the car without actually driving it.

Soon it will be a backseat computer controlling our cars.

The self-driving car is no longer just a dream. It is already here. Bits and pieces of it, at least. Many new cars use cameras and sensors to park themselves. Others have computers that can stop the car without the driver even touching the brakes if the computer's sense that an accident is about to happen.

Saved By The Car?

Next year, cars from General Motors will go even further. Some of the cars will have vehicle-to-vehicle communication technology, or V2V for short.

V2V technology allows cars to "talk" to each other through electronic signals. These cars will know where other cars are and how fast they are going. They will use V2V to avoid accidents.

V2V should stop some common accidents. An example is when a driver stops paying attention, runs a red light and hits another car.

With V2V, the driver would be saved by the car. It would brake the car at the light. The accident would never happen.

Technology like V2V in a car is good. However, taking all control from the driver could be terrible. A driver should always have some control of the car.

Quite simply, computers have problems. Some kind of computer problem is bound to happen with a self-driving car. There will be many things that could cause a problem. Driving in a hot summer, a cold winter or a heavy rainstorm could all cause problems for a car's computer.

Over time, something will go wrong. When it does, the problem will be much worse if the driver cannot take control of the car. If the computer fails, the driver will need control to stop an accident from happening.

Insurance And Traffic Laws

Another problem is how car insurance rules will change.

Insurance protects the driver from paying for accidents. If the driver no longer actually drives the car, he or she may not need insurance. Without insurance, paying for accidents caused by a self-driving car could be very complicated.

An even bigger problem is traffic laws. Sometimes it is necessary to ignore a law in order to avoid an accident.

For example, cars cannot cross double yellow lines. It is against the law to do so. If a child runs into the path of a car, the only way to avoid the child might be to drive over those lines. A human would do that. A self-driving car might not. The car might not be able to ignore that law in order to avoid an accident.

Technology is usually a good thing. However, it is a problem when technology is not under human control. That could happen with self-driving cars.

Technology that helps human drivers is a great idea. Technology that gets in their way could be a very bad idea.

Article 7: Source: LiveScience

http://www.livescience.com/50841-future-of-driverless-cars.html

Title: Self-Driving Cars: 5 Problems That Need Solutions

Google recently released data showing that its self-driving cars have been involved in 11 minor crashes over the past six years, which has raised questions about when such autonomous vehicles will be ready for prime time.

The report suggests that most of the crashes were likely due to human driver error, and may not have been preventable, said Steven Shladover, a researcher at the Partners for Advanced Transportation Technology at the University of California, Berkeley.

Still, while some levels of automation are already in existing cars, completely driverless cars — without steering wheels or brakes for human drivers — would require much more innovation, Shladover said. [10 Technologies That Will Change Your Life]

"If you want to get to the level where you could put the elementary school kid into the car and it would take the kid to school with no parent there, or the one that's going to take a blind person to their medical appointment, that's many decades away," Shladover told Live Science.

From ultra-precise maps to fail-proof software, here are five problems that must be solved before self-driving cars hit the roadways.

Better software

Driving in the United States is actually incredibly safe, with fatal crashes occurring once every roughly 3 million hours of driving. Driverless vehicles will need to be even safer than that, Shladover said.

Given existing software, "that is amazingly difficult to do," he said.

That's because no software in laptops, phones or other modern devices is designed to operate for extended periods without freezing, crashing or dropping a call — and similar errors would be deadly in a car. Right now, Google's self-driving cars avoid this by having both a backup driver and a second person as a monitor, who can shut off the system at the first hint of a glitch. But coming up with safety-critical, fail-safe software for completely driverless cars would require reimagining how software is designed, Shladover said.

"There is no current process to efficiently develop safe software," Shladover said. For instance, when Boeing develops new airplanes, half of their costs go to checking and validating that the software works correctly, and that's in planes that are mostly operated by humans. [Photos: The Robotic Evolution of Self-Driving Cars]

Better maps

Nowadays, Google's self-driving cars seem to operate seamlessly on the streets of Mountain View, California. But that's because the company has essentially created a kind of Street View on steroids, a virtual-world map of the town. That way, the self-driving cars know exactly how the streets look when empty, and only have to fill in the obstacles, such as cars and pedestrians, reported The Atlantic.

Driverless vehicles, with their current sensors and processing, may not be able to operate as smoothly without such a detailed map of the rest of the world, according to the article, but so far Google has mapped only about 2,000 miles (3,220 kilometers) of the 4 million miles (6.4 million km) of roadway in the United States.

Better sensors

Before people all toss their drivers' licenses, a self-driving car must be able to distinguish between dangerous and harmless situations.

"Otherwise, it's going to be slamming on the brakes all the time for no reason," Shladover said.

For instance, potholes or a nail below a tire are incredibly hard to spot until just before they've been hit, while a paper bag floating across the highway may be very conspicuous, but not very dangerous, he said.

The cars also need to decide in sufficient time whether a pedestrian waiting on the sidewalk is likely to walk into traffic, or whether a bike is going to swerve left. Human brains do a masterful job of sorting and reacting to these hazards on the fly, but the current crop of sensors just isn't equipped to process that data as quickly, Shladover said.

Better communication

Once driverless cars begin to proliferate, they will need a much better way to communicate with other vehicles on the road. As different situations emerge, these cars will need to flexibly adjust to other cars on the roadways, reroute on the fly and talk to other driverless cars. But right now, communication among individual self-driving cars is minimal.

"If they don't have the communication capability, they will probably make traffic worse than it is today," Shladover said.

Ethical robots

And then there are the ethical issues. Sometimes, a driver must decide whether to swerve right or left, for instance — either injuring three people in a truck or potentially killing a person on a motorcycle. Those types of ethical dilemmas would require the software in a self-driving car to weigh all the different outcomes and come to a final solution on its own.

A machine that can do that would be unprecedented in human history, Shladover said. Even drones that target enemies in war are remotely manned by a human who has final say about the killing, Shladover added.

"There's always a human on the other side who has to make that decision about using deadly force," Shladover said.

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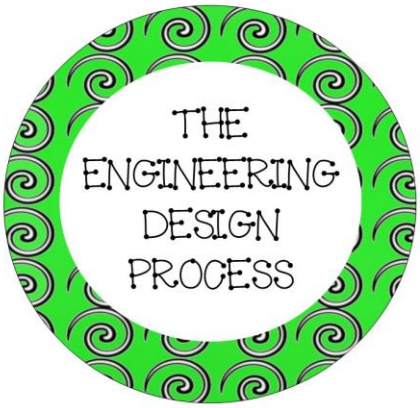
Other Achieve3000 articles that are aligned to the topic that could be assigned to students:

Search Results: 8

Lesson	Topic
 **Hands Off! The Car Is Driving!** (Grades 2-12) Nissan took reporters on a test drive in its new self-driving car. The company plans to make the technology available in cars in 2020. Posted: October 13, 2015 WI standards — Assign | Add to Unit	**News:** Business
 **Robot Cars** (Grades 1-12) ARTICLE ONLY Three cars without drivers are being tested in Nevada. If they work well, there will be more of them in a few years. Posted: October 20, 2012 WI standards — Assign | Add to Unit	**News:** Technology
 **Sooner Than You Think** (Grades 2-12) ARTICLE ONLY Google will work with another company. They will test technology that helps cars drive themselves. Posted: September 10, 2016 WI standards — Assign | Add to Unit	**News:** Technology
 **Nice and Slow** (Grades 2-12) ARTICLE ONLY A car driven by a computer breaks a law. Do the police give out a ticket? Posted: April 23, 2016 WI standards — Assign | Add to Unit	**News**
 **Plug In, Pay Up?** (Grades 9-12) Lawmakers in Washington State are considering a plan to charge owners of electric cars $100 a year. Posted: August 22, 2011 WI standards — Assign | Add to Unit	**News:** Across the US
 **Look! No Hands!** (Grade 7) CHALLENGE LESSON In this WFE Challenge Lesson, you'll read and watch a slideshow about driverless car technology. Then you'll look at a chart showing benefits and drawbacks of driverless cars. Posted: June 21, 2016 WI standards — Assign | Add to Unit	**WFE Challenge**
 **No Driver? No Problem!** (Grade 4) Audi is testing a new car that would not need a driver! Posted: May 5, 2014 WI standards — Assign | Add to Unit	**Engineering:** Information Technologies and Instrumentation
 **What Would You Do?** (Grade 11) CHALLENGE LESSON When two bags of cash fell out of an armored truck traveling on the highway, many people stopped to grab what money they could. Others drove past the scene. What would you do? Posted: July 12, 2014 WI standards — Assign | Add to Unit	**WFE Challenge**

Self-Driving Cars, Running on CODE

STEM Journal



STEM Challenge:

What is the most efficient algorithm using your neighborhood grid that will get your car from one location to another?

Name: _____

Group Members: _____

Date: _____

STEM Vocabulary

Vocabulary used in this project:

Word	Picture	Definition

Building Background Knowledge
Rolling Journal

Passage/Article	New and important learning about the topic	How does this resource add to what I know?

Building Background Knowledge
Rolling Journal

Passage/Article	New and important learning about the topic	How does this resource add to what I know?

Following the Engineering Design Process

Ask: What's the problem? What's the challenge?	What is the most efficient algorithm using your neighborhood grid that will get your car from one location to another?
Imagine: What are some solutions? Apply background knowledge to topic.	Write algorithm: Find different ways to move around your map. *Research & background knowledge*: computer coding and self-driving cars.
Plan: Draw a diagram. Create a blueprint. Make a list of materials you will need.	Create blueprint design of your neighborhood. Materials: list the different algorithms to get around the map of their neighborhood. Include a compass rose. Set up your neighborhood using a coordinate grid.
Create: Follow the plan and create it. Build your prototype. Test it out.	Write the algorithm and build your map. Test your algorithm: Did you get to the correct location? Was your final algorithm the most efficient way?
Improve: Make your design better. What changes need to be made?	What changes will you make to your algorithm or neighborhood? How can you use your algorithm to write a code?

Planning Ideas

Brainstorm information you would like to include in each area of the project.

Important Information about self-driving cars	Details of Neighborhood
Brochure	**PowerPoint**

Neighborhood Design

The coordinates for each location must be included

MUST include the following:

- ❑ library
- ❑ 6 - 8 homes
- ❑ school
- ❑ compass rose
- ❑ streets need to be named
- ❑ park
- ❑ Include a coordinate grid starting at (0,0)
- ❑ Group Choice: add 2 locations of your choice

(ex. yoga studio, barber shop, grocery store)

Title of neighborhood:

_____

Engineers: _____

Ask/Problem:

What is the most efficient algorithm using your neighborhood grid that will get your car from one location to another?

Imagine/Background: Write what you know about self driving cars. Use notes from your rolling journal to write a few facts about self driving cars.

_____

_____

_____

_____

_____

_____

_____

_____

_____

PROS/CONS of Self Driving Cars/Coding

PROS	CONS

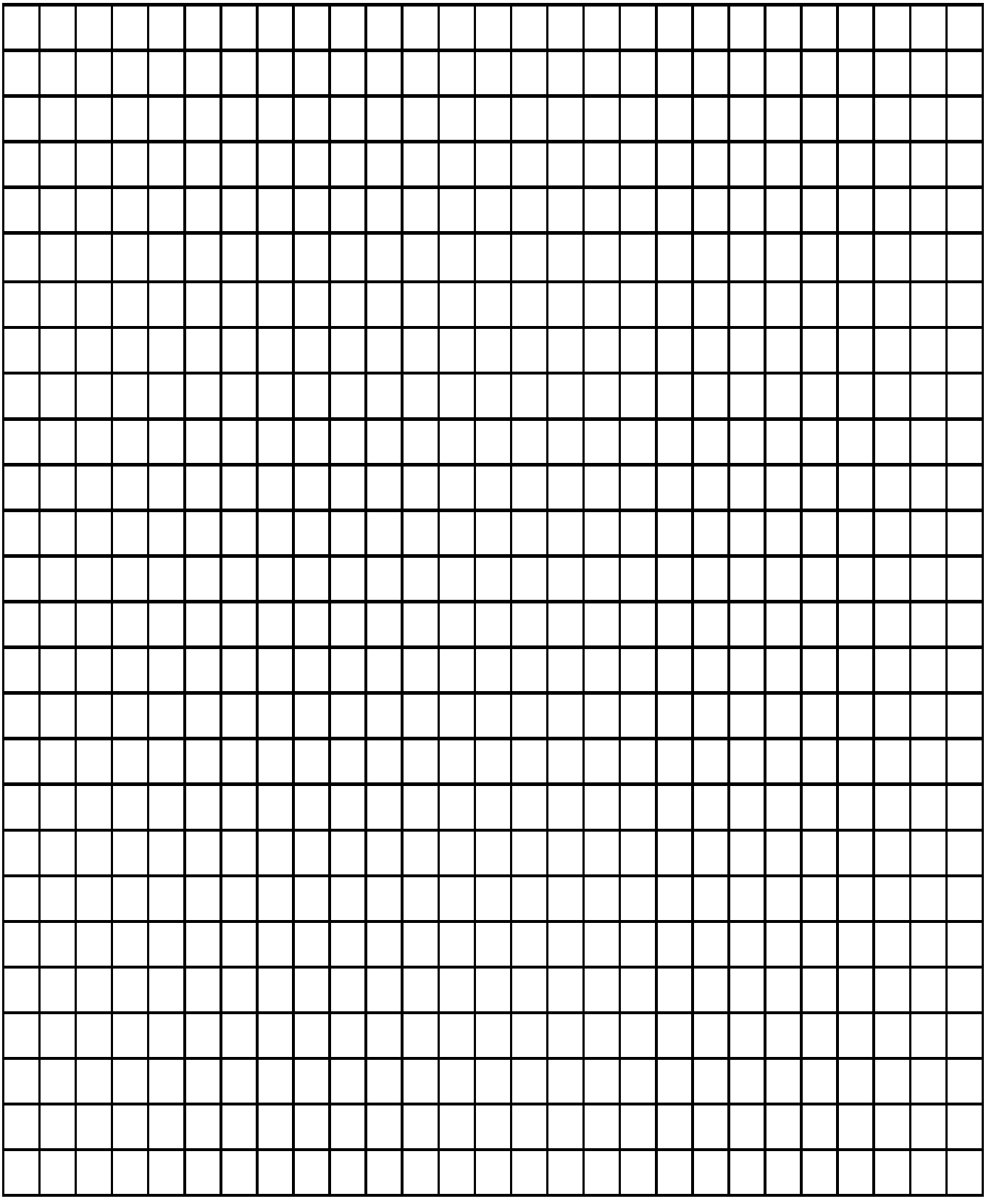
Planning - Blueprint

Planning your neighborhood and code:

Decide the locations you are going to have in your neighborhood and list the coordinates of the front door for each location.

Locations	Coordinates

Planning - Blueprint of neighborhood map



Planning your algorithm

Starting Location:	

Creating:

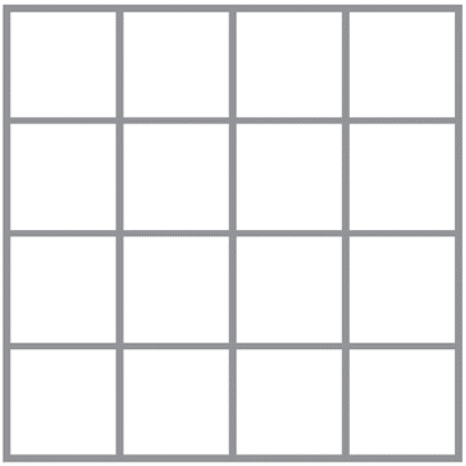
Use chart paper to make your model of your neighborhood

Write your algorithm to get around your neighborhood in the most efficient way.

Improve: What improvements would you make to your algorithm used for your neighborhood?

Use the symbols below to write a program that would draw each image.

Create your image.

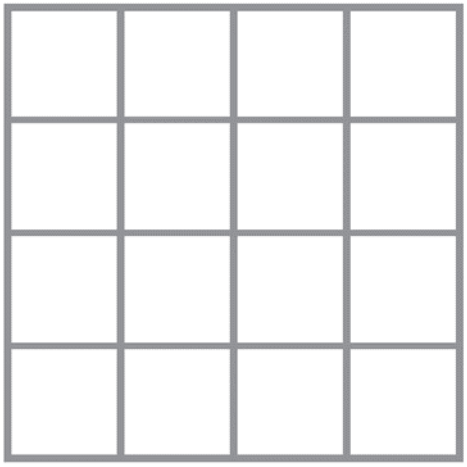


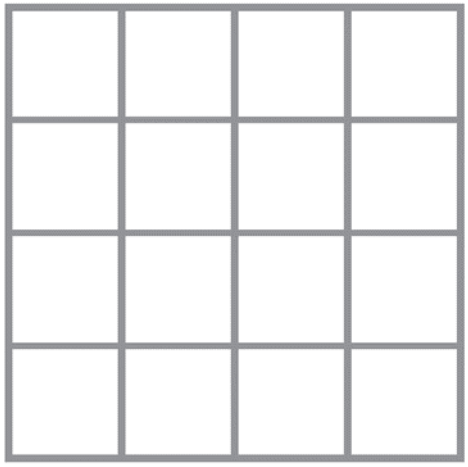
_____fold to here_____

Write the algorithm to match your image.

Step 1	2	3	4	5	6	7	8	9	10
Step 11	12	13	14	15	16	17	18	19	20

Partner will use your algorithm to create the image on the grid.





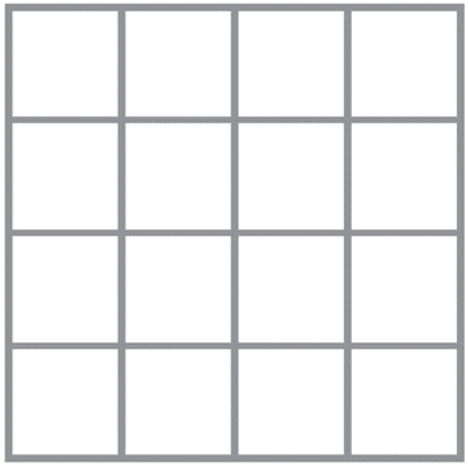
Use the symbols below to write a program that would draw each image.

Designer creates image in grid.

Partner writes the algorithm to match the grid above.

Step 1	2	3	4	5	6	7	8	9	10
Step 11	12	13	14	15	16	17	18	19	20

Check partners' algorithm using the grid below.



Do the two images on the grid match? _____

Planning - Blueprint

Planning your neighborhood and code:

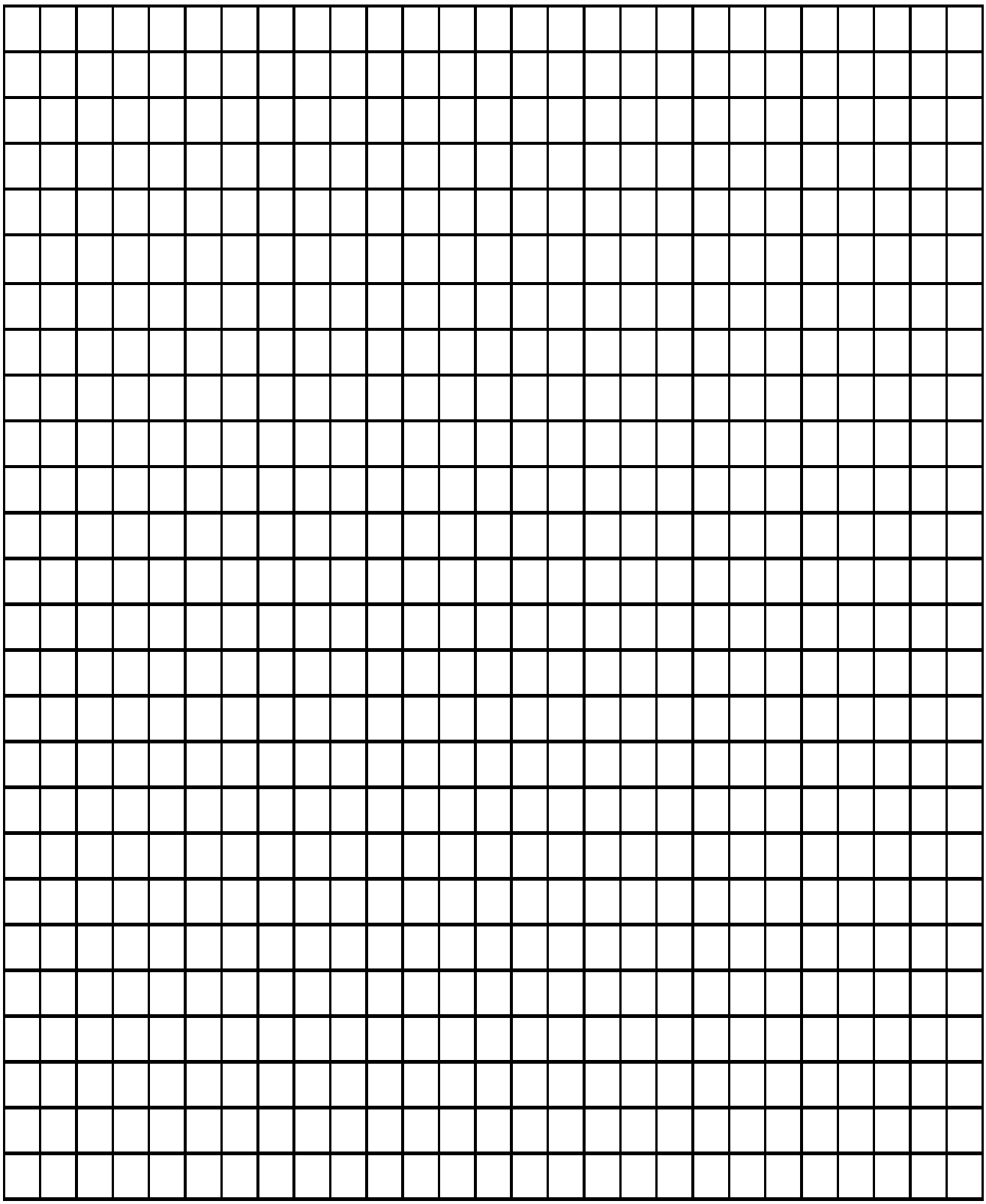
Decide the locations you are going to have in your neighborhood and list the coordinates of the front door for each location.

Locations	Coordinates

Planning your algorithm

Starting Location:	Coordinates		Algorithm (direction and number of blocks)	New Coordinates
Ending Location	Coordinates			

Planning - Blueprint of neighborhood map



Calendar for Unit Planning: Self-Driving Cars

Week 1	Monday	Tuesday	Wednesday	Thursday	Friday
Computer Science Fundamentals	Introduce code.org	Unplugged #1 Graph Paper Programming	Unplugged #2 Real-Life Algorithms	Course 2 Online	Course 2 Online
Math	Eureka Module 6 Lesson 1	Eureka Module 6 Lesson 2	Eureka Module 6 Lesson 3	Eureka Module 6 Lesson 4	Eureka Module 6 Lesson 5
Close read-focus on introduction to self-driving cars and dangers	Video 1: Inside Uber's self driving car. Article 1: Hands off the car driving (Achieve 3000)	Article 1: Wonderopolis - Can a car drive itself?			Video: Wonderopolis - How does a Google self driving car work?
ELA	**Lesson Title:** Brochure Introduction/Pulling Resources/Vocabulary DAY 1 **Objective:** A: Introduce the idea of the brochure and explore the rubric. B: Students will gather information from resources to use in their writing. C: Students will fill cloze sentences and define pre-determined vocabulary words.	**Lesson Title:** Verb Tenses/Vocabulary DAY 2 **Objective:** A: Students will form and use the past perfect tense B: Students will fill cloze sentences and define pre-determined vocabulary words. **Lesson Source:** https://educators.brainpop.com/lesson-plan/3-3-4-past-perfect-lesson-plan	**Lesson Title:** Incorporating Vocabulary into Writing & Vocabulary Day 3 **Objective:** A. Students will use vocabulary specific to the self-driving car lessons in their brochures. B. Students will determine synonyms and antonyms for each vocabulary word.	**Lesson Title:** Verb Tenses/Vocabulary DAY 4 **Objective:** A: Students will recognize and correct inappropriate uses of verb tense B: Students will practice using vocabulary words in practicing activities C: Students will work on their self-driving car brochures.	**Lesson Title:** Brochure Completion & Vocabulary Assessment **Objective:** A. Students will work on their self-driving car brochures. B. Students will demonstrate their knowledge of vocabulary words. C. Students will share their completed work with classmates.
Week 2	**Monday**	**Tuesday**	**Wednesday**	**Thursday**	**Friday**
Computer Science Fundamentals	Unplugged #3 Getting Loopy	Course 2 Online	Unplugged #4 Relay Programming	Course 2 Online	Unplugged #5 Conditionals

Math	Eureka Module 6 Lesson 6	Eureka Module 6 Lesson 7	Eureka Module 6 Lesson 8	Eureka Module 6 Lesson 9	Eureka Module 6 Lesson 10
Close read- focus on pros and cons of self-driving cars	Video 3: Ethical Dilemma video Driverless cars pros and cons	Article 2: Auto Insurance Center top 20 pros and cons	Article 3: NewsELA Government paves the way for self driving cars	Article 4: NewsELA Is the idea of driverless cars paving the way?	Video 4: Driverless cars pros and cons
ELA	**Lesson Title:** Introduction of 5 Paragraph Essay & Vocabulary **Objective:** A: Introduce the 5 paragraph essay and the rubric. B: Students will begin gathering information from resources to use in their writing. C: Students will fill cloze sentences and define pre-determined vocabulary words.	**Lesson Title:** Taking a Stance PART 1 & Vocabulary DAY 7 **Objective:** A: Students will learn how to take a stance and apply their learning to the self-driving car debate. B: Students will fill cloze sentences and define pre-determined vocabulary words. **Lesson Source:** http://www.readwritethink.org/classroom-resources/lesson-plans/convince-developing-persuasive-writing-56.html?ta=4 (MODIFIED)	**Lesson Title:** Taking a Stance PART 2, Writing an Introduction, & Vocabulary DAY 8 **Objective:** A/B: Students will learn the different ways to persuade a reader and apply that learning towards drafting their introduction. C: Students will determine synonyms and antonyms for each vocabulary word. **Lesson Source:** http://www.readwritethink.org/classroom-resources/lesson-plans/convince-developing-persuasive-writing-56.html?tab=4 (MODIFIED)	Use the **"building an argument"** (in folder) template to organize and summarize their thoughts Vocabulary: Practice games	Deep dive into each paragraph. Students should fill out an "Opinion Writing" graphic organizer for each paragraph of the body. Mini-Lesson: Conclusion Vocabulary: Assessment
Week 3	**Monday**	**Tuesday**	**Wednesday**	**Thursday**	**Friday**
Computer Science Fundamentals	Unplugged #6 Binary Bracelets	Course 2 Online	Unplugged #7 The Big Event	Course 2 Online	Unplugged #8 Your Digital Footprint
Math	Culminating Task: Urban Neighborhood Planning	Culminating Task: Urban Neighborhood Blueprint	Culminating Task: Urban Neighborhood Design	Culminating Task: Algorithm Coding	Culminating Task: Coding Carousel

Close read- focus on the future of self-driving cars	Article 5: Sooner than you think Achieve 3000	Article 6: Around the Corner NewsELA		Article 7: Self-Driving Cars- 5 problems that need solving	
	Mini-Lesson: Transition Vocabulary and Key Words Self-edit draft for words / phrases taught in mini-lesson Vocabulary: Use words from previous two weeks and "Words Worth Knowing" for vocabulary activities	Peer edit essays Vocabulary: Word Work activity/game	Finalize essays Vocabulary: Word Work activity/game	Students will participate in a debate about self-driving cars. (Salsa line-up, play devil's advocate) - Practice day Vocabulary: Assessment	Present final "mini-debate" to the class. Vocabulary: Celebration