Task Overview

If you are searching to build trust and good collaborative working relationships, it is essential to have good communication skills in the workplace. Communication embraces many different components in the workplace. Communication is the method to share information with colleagues, is part of team building, customer service, conflict management and every interaction that takes place that involves some form of communication. The goal of all communication is to develop a common understanding in what was said and the message that comes across is the same to all parties involved. Communicating in the workplace is full of challenges and can be a very difficult task at various times. It takes a strong sense of self and personal confidence to allow yourself to become vulnerable with your colleagues that you interact with. Communication is essential because this is how growing successful working relationship occurs.

In this task, you will be reading and interpreting a technical text for use in developing customer understanding of **CARBURETORS**. This text will then be utilized to prepare written and verbal/interpersonal information to relate understanding by co-workers and customers.

While working for a local dealership’s service group, you have been asked to let a customer know that their carburetor will need to be replaced on the collector’s vehicle (a custom 1962 Dodge Charger) they just purchased through a private sale. Your supervisor has warned you that this customer will want to know more about the carburetor, what it does, and why it needs to be replaced.

Materials

- Student Response Sheet
- Highlighter or marking tool
- Pen or pencil
- Computer with Internet Access

Directions

- Read and annotate the text to further your understanding and to find evidence to support your response to the prompt.
- In small groups, have one group member lead the discussion. The group discussion should be text-based and relate to the overall understanding of the text.
CTE Beginning-of-Year Assessment: Student Response

- After group discussion, independently complete the argument writing task. The pre-writing sheet should be turned in with your completed argument writing task. Remember the criteria for writing an argument:

**Wisconsin Common Career Technical Core Standards (WCCTS)**
- CD4.a.8.h: Apply communication strategies when adapting to a culturally diverse environment.
- CD4.c.1.e: Recognize the appropriate behavior and communication skills necessary in adult interactions.
- IMT3.a.6.m: Demonstrate the ability to use electronic communication technology.
- IMT3.b.4.m: Apply communication and information technology to the various elements of a problem.
- IMT3.b.7.h: Use communication and information technology to effectively solve a given problem.

**Common Core State Standards**
- CCRR1: Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.
- CCRR10: Read and comprehend complex literary and informational texts independently and proficiently.
- CCRRW2: Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content.
- CCRRW4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
- CCRL1: Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.
- CCRL4: Present information, findings, and supporting evidence such that listeners can follow the line of reasoning and the organization, development, and style are appropriate to task, purpose, and audience.
- CCRL6: Acquire and use accurately a range of general academic and domain-specific words and phrases sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.
Task Activity: Plan Your Technical Writing

Prompt: While working for a local dealership’s service group, you have been asked to let a customer know that their carburetor will need to be replaced on the collector’s vehicle (a custom 1962 Dodge Charger) they just purchased through a private sale. Your supervisor has warned you that this customer will want to know more about the carburetor, what it does, and why it needs to be replaced. Write a few paragraphs that can be added to the customer’s service detail sheet (and potentially the dealership’s service website as a frequently asked question).

Directions: Use this page to plan your writing.
CTE Beginning-of-Year Assessment: Student Response

Task Activity: Technical Writing Task

May also be done electronically.

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Task Activity: Plan Your Technical “Conversation”

Prompt: While working for a local dealership’s service group, you have been asked to let a customer know that their carburetor will need to be replaced on the collector’s vehicle (a custom 1962 Dodge Charger) they just purchased through a private sale. Your supervisor has warned you that this customer will want to know more about the carburetor, what it does, and why it needs to be replaced. Plan your conversation with the customer.

To complete this task, use www.voki.com, develop an avatar, and use the “call in” feature to “present your information” to the customer, Mr. Davis.

Directions: Use this page to plan your conversation.
It's safe to say that just about every person reading this magazine has built, driven, worked on, or tampered with at least a few cars in your lifetime that were equipped with a carburetor. In most cases, you have probably owned several carbs, including a few that are most likely stashed in a corner of the garage or disassembled into a forgotten pile of parts on the workbench. One of the most misunderstood parts of the engine, the carburetor is essentially a basic air/fuel meter that regulates how efficient that giant air pump (your engine) under the hood is. So if carbs are so simple, why is a How It Works article necessary, you ask? Because the current slew of aftermarket four-barrels available on the performance scene today benefit from cutting-edge design and engineering, and to truly take advantage of the power and reliability these units offer, one must first understand how they work and how to properly adjust them. Hopefully by the time you stuff this issue back in the magazine rack next to your throne, you'll be well versed in fuel metering lingo.

Get ready, things are about to get a little wordy. Whether you're running a fully tricked-out modern four-barrel or a box-stock Model A single-pot, all carburetors work because of a theory called the Bernoulli Principle, which explains not only how fuel delivery systems work but the basics of lift and flight, as well. The principle is this: As the velocity of a gas increases, the pressure drops. This change in pressure is linear to the change in velocity. When a piston in your engine drops down in the cylinder on the intake stroke, it creates a vacuum in the cylinder compared to the atmospheric pressure of the outside world. Pressure is constantly trying to regulate itself, so air comes rushing from the outside (in this case, your engine compartment), through the carburetor, and into the empty cylinder. As the air is pulled into the carburetor venturi, it has to accelerate from a standstill, and the acceleration is regulated by the speed of your engine and the position of the throttle blades in the carburetor. The pressure difference between the carb venturi with air rushing through it and the higher atmospheric pressure of the outside world creates a vacuum, which actually pulls fuel out of a reservoir in the carburetor (called a float bowl), through a small port (called a jet), and into the airstream. As stated in the Bernoulli Principle, the faster the air moves, the higher the vacuum gets, which means more fuel is pulled into the airstream; therefore, no matter what the engine speed, the fuel-to-air ratio stays constant. If you have the proper-size venturis that will flow the necessary air for your engine, and if the jets supply the right amount of fuel, a carburetor will supply your engine with the perfect amount of fuel (gas and oxygen) under just about any condition. Hence, factory automobiles came equipped with them for more than 80 years.

This also explains why you can take a tiny two-barrel carb and bolt it to a healthy big-block, or take a giant four-barrel race unit and stick it on a six-cylinder, and both engines will run. Granted they won't make optimal power, but because the air/fuel ratio is always naturally balanced, both engines will have enough properly balanced fuel and oxygen to run as long as the jetting is correct.

So now that we have covered the basic principles behind how a carburetor works, let's take a more specific look at the most popular fuel delivery system in the street rod and custom world, the common four-barrel. Companies like Holley, Demon, Edelbrock, and Carter make different versions of the venerable four-holer, but they all work with the same basic rules in mind, which makes understanding, tuning, and choosing one all that much easier. Until the early to mid '60s, performance carburetion usually involved varied combinations of two-barrel carbs, running the gamut from your basic dual Stromberg 97 setup found on hundreds of flathead-powered hot rods to the much more exotic Tri-power and six-pack setups offered on factory powerplants like 389 Pontiacs and 390 Fords. The musclecar revolution changed all that, however, as Detroit engineers figured out that a single four-barrel with a properly designed aluminum intake manifold could make as much or more horsepower as a multi-carb setup, and a single carburetor was cheaper to build and easier to tune. Soon an entire gamut of factory rods came equipped with giant quivering muscle motors, all of which were topped off with Holley and Carter four-barrels. Four decades later a lot has changed in the performance world, including the advent of modern fuel injection, but the same basic four-barrel designs are still just as popular as they ever were.
CHOOSING A CARBURETOR

One thing that has changed over the years is the selection available to the modern consumer. As we mentioned earlier, there are several companies currently developing and manufacturing a wide variety of carbs for the performance market, so the big trick is finding the perfect piece for your ride. Although just about any carb will work on any motor, it doesn't necessarily mean it will work well. Unlike most things in hot rodding, when it comes to fuel delivery, bigger is not necessarily better. A motor with too much carb will not want to idle, can run weak off idle, and will be sluggish all around. Then again, too small a carburetor will limit the horsepower your engine can produce, and since decent carburetors don't come cheap, you don't want to end up playing a trial-and-error game with your fuel delivery system. The best way to go is to first determine the cfm (cubic feet per minute of airflow) necessary to keep your mill well fed, then dial-in exactly what type of unit will perfectly suit your car and driving style.

HOW TO CALCULATE CFM

Multiply the cubic inch displacement of your motor by the maximum rpm the engine will attain, then divide the total by 3,456. The resultant number will be the cfm necessary for your engine to run at 100 percent volumetric efficiency. For you math guys, the formula looks like this:

\[ \text{CID} \times \text{max RPM} / 3,456 = \text{CFM} \]

(example: 350 x 6,000 rpm = 2,100,000 / 3,456 = 608 cfm)

The engine in the above example would need a 600-cfm carburetor to run at 100 percent volumetric efficiency. Only the mostly highly modified and efficient race engines can get even close to 100 percent efficiency. Most street motors are closer to 85 percent, but the number is still good for a baseline. Therefore, a 600 carb would be just about perfect.

The next step after determining the cfm of your carburetor is to choose whether you need vacuum or mechanical secondaries. The beauty of a four-barrel carburetor is that most of the time the engine only needs a very small amount of fuel to run, so the first set of venturis, called primaries, are in action. When necessary under heavy acceleration, the second set of venturis, called secondaries, open up and provide what is essentially an extra set of lungs. The most common type of carburetor uses vacuum-operated secondaries, which utilize and increase in load and engine vacuum to gradually pull open the extra throttle blades.

However, in engines with extremely large-duration camshafts where low-speed vacuum (or lack thereof) is an issue, this is not always the ideal setup. The other form available is a mechanical secondary, which allows the driver to control the secondary system. While control sounds like a great thing, in many situations if a person slams his paw down to the pedal, the resulting dump of air down the motor can actually cause a huge lean spot as vacuum fails to pull in enough fuel for a proper ratio, causing a flat spot in acceleration. This is where vacuum secondaries come in handy.

Relatively mild motors with stock- or RV-grind camshafts and rods that are mostly used for cruising are usually better off with a vacuum secondary carburetor. For detailed information on how vacuum secondaries function see the illustration in this article, but in a nutshell this type of system utilizes increased engine vacuum and load at high engine speeds or under acceleration to pull open the second set of throttle blades and thereby gradually increase the amount of air and fuel going into the motor as necessary.

Mechanical secondaries come in handy with large motors built to make serious horsepower, as long as the power valve, jet, and ramp settings are correct. Rather than relying on vacuum pulling a diaphragm, mechanical secondary carbs, which are often also "double pumpers" with two accelerator pumps, utilize a mechanical linkage to open the second set of throttle blades. These units are best in high-performance motors with lots of cam and very little vacuum, as well as in certain heavy-duty applications where a large vehicle...
might be pulling too much vacuum under loads, thereby using secondaries unnecessarily and decreasing fuel mileage. In this instance the control of a mechanical secondary is preferable.

Finally, once you have chosen the size and style of carb needed for your application, it's time to choose a brand. Holley, Demon, and Edelbrock all make excellent products in a wide array of sizes and styles designed to suit a variety of applications. All three manufacturers have tech lines open where professionals are available to help you make a more informed decision, and there are several aftermarket tuning shops that also specialize in taking things a step further by custom-building carburetors for a customer's unique, individual application. Now follow along as we detail the various parts and pieces that make the typical four-barrel work. If you have any further questions, go find an old junk carb, take it apart, and put it back together a few times...it worked for us!

BITS AND PIECES

**Choke:** The choke, which can be either manual or electrically operated, is a small standoff or horn that surrounds the primary venturis with a moveable door on top. When a motor is cold, it is hard to keep running, much like a freshly started camp fire, so the choke door closes, thereby cutting down airflow and drastically enriching up the air/fuel ratio. This is essentially what your pyro buddy in Boy Scouts was doing when he would douse the green firewood with an entire bottle of lighter fluid...starting things off with lots of fuel to stoke the fire. Once the motor warms up, the choke opens and the air/fuel ratio returns to normal.

**Floats and Float Level:** The float in most four-barrels is a small plastic or metal cylinder that sits inside the fuel reservoir, called a float bowl, and determines the amount of gas flowing into the carburetor. Standard Holley and Demon carbs have a sight hole in the side of the bowl, and the proper way to set the level is to pull the plug while the motor is running (keep a rag handy to mop up spilled gas) and adjust the screw in the top of the bowl until fuel just touches the base of the sight hole without running out.

**Idle Circuit:** Since the vacuum created by air's rushing through the venturis at speed is what normally draws fuel into the engine while the motor is at speed, a different solution had to be thought up for when the motor is idling and the throttle blades are barely open. The idle circuit supplies fuel in this situation, and mixture screws let you adjust the air/fuel mixture of this circuit.

**Accelerator Pump:** The accelerator pump supplies fuel pressure to compensate for losses in fuel flow when the airflow signal to the booster venturis diminishes as you accelerate off idle.

**Power System and Power Valve:** These are vacuum-operated valves that open and close at preset amounts of manifold vacuum, which is measured from 2.5 to 10.5 inches. The lower the number, the later the valve opens. These same numbers are punched onto replacement power valves, and metering comes from small holes directly beneath the valve. Edelbrock and Carter carbs do not use a power valve. Instead, they rely on metering rods that run through the main jets. As manifold vacuum drops under power, a spring under the rod holder raises the tapered rod out of the jet and allows more fuel to flow past, meaning the mixture gets richer. One benefit of the Edelbrock system is that metering rods do not blow out when an engine backfires, which can occasionally happen with power valves.

**Jets:** The jets are small, threaded plugs in the base of the carburetor in the metering block which regulate the amount of fuel that flows from the float bowl into the venturi. The ideal carburetor will have a perfect air/fuel ratio, which can sometimes mean a few jet adjustments. The easiest way to check your jetting without an air/fuel meter is to find a nice stretch of deserted road, accelerate hard, then shut the motor off before it has a chance to idle. Then pull a few spark plugs and check the color of the porcelain. It should be a nice light-brown-cocoa color. If it's any lighter, your motor is running lean, which could hurt power and, in a worst-case
scenario, even burn a piston. If the motor is running rich, the color could be dark brown or even black. A good way to adjust jet size is to go up or down as necessary two sizes at a time until the optimal ratio is set.