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NACAT News



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Supplementing Curriculum with YouTube Content

By: Grant Swaim

YouTube launched in 2005 and is now the second most visited website after the Google Search page. This trend is driven by the public's growing desire for rich media over text and images. YouTube contains a large amount of automotive content in categories, such as: car sales (new and used), car reviews, motorsports, car repair videos, and a host of lesser categories. This article will focus on the use of YouTube videos in automotive education.

Due to the huge amount of videos already on YouTube and with 720,000 hours of video uploaded every day, even if less than 1% are worth using in the classroom, that's still a lot of content. However, just like Cinderella had to kiss a few frogs to find her prince, automotive educators need to kiss a few frogs to find their "prince" videos.

Over eight years ago, while I was teaching in the NC Community College System, I started curating YouTube videos and organizing them into topic specific playlists. I continued to work on the video curation over the years and it now contains over 2,400 YouTube videos sorted into 118 unlisted YouTube playlists. I recently posted the playlists on a public web page which can be found at <https://gearhead.school/curated-youtube-playlists/> and made a post about it in the Automotive Technology Instructor Network (ATIN) Facebook group which can be viewed at <https://www.facebook.com/100022416552860/videos/899411557482721/>. The post was well-received and I was asked to write this article about the subject for the NACAT newsletter.

Ground zero for the curation process is to identify channels with content that complements the existing course curriculum. The best types of videos for instruction are short and topic-specific, so channels that produce this type of video content should be sought out and subscribed to. By subscribing to a YouTube channel you will be notified each time they upload a new video. Even if you only use 10% of a given channel's content, by subscribing to a number of good channels (I subscribe to about 30), this system produces a lot of usable content.

After identifying channels to follow, each channel's videos need to be reviewed to see if they should be added to a topic specific playlist. Some of the considerations are accuracy, professionalism, and overall educational value. For starters set up a playlist for the 8 ASE categories and add subcategories as needed. For example my A8 - Engine Performance category contains 25 playlists.

Even better are videos made in the "looking over-the-shoulder" style where you follow a diagnostic procedure from start to finish from the perspective of the tech. These videos can be used in conjunction with existing course material for a good blended learning experience.

Channel Recommendations

Some of the channel's that consistently generate good usable content for the classroom are listed in the following categories.

DiagnoseDan

<https://www.youtube.com/channel/UCR73yN7vT7-P541g2qlfRrg/featured>

Dan runs a shop in the Netherlands and produces excellent diagnostic videos. You get to follow Dan's methodical diagnostic approach from start to finish.

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NACAT Remembers

Robert John Chabot

I miss my friend. I have missed seeing Bob at industry events. I miss his smile, his laugh, his curiosity, his genuine concern for people, and his passion to learn and share. Bob was a huge supporter and advocate of NACAT. Always there to learn, always offering to help, and never afraid to offer an outsider's perspective, but Bob was never an outsider, Bob was family, an important member of the NACAT family. Many times NACAT benefited from Bob's style of asking probing questions and offering guidance. Bob was a wise man that challenged you to think. I recall so many conversations with Bob, either individually or as part of a group that I appreciated his counsel.

I know I am joined by many in missing Bob. So, I believe we should all find comfort in knowing Bob's smile and enthusiasm is filling a classroom now, just in a different place.

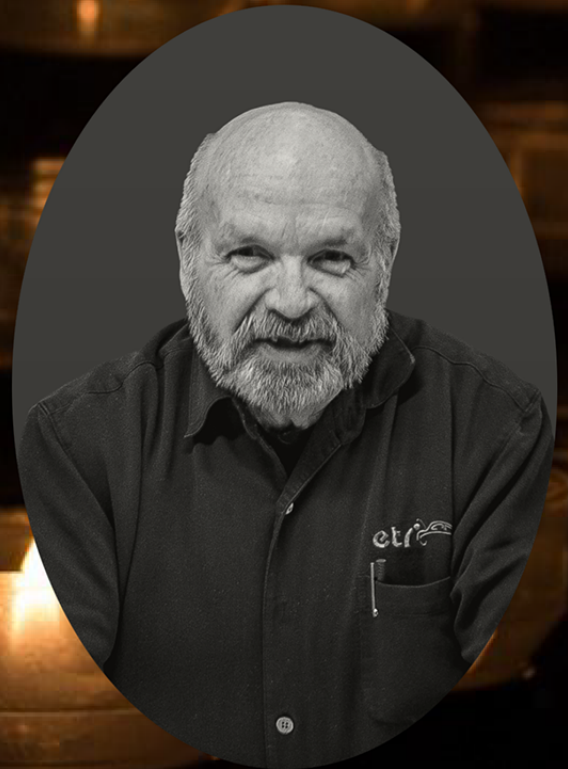
Bill Haas

I didn't know Bob really well. I had worked with Bob once or twice on some articles for the NACAT eNews, so any contact I had with him was by phone or email. I had the opportunity to meet him at the 2018 NACAT conference at Penn State College. It was very memorable, as he made an impression with how personable he was. He was a really down to earth, genuine guy. We talked for quite a while, about all kinds of things: teaching of the automotive trade, some of both our backgrounds, his background in Canada, and how he got to where he was (all quite interesting). As our conversation went on, I felt as if I was talking to someone I had known my whole life, but had really only met in person moments earlier. There was a connection I had made that to this day I can not describe. As they say, we've lost one of the good guys, and I would have loved to have had more time to talk with him.

Jason Bronsther

I will sincerely miss Bob and the random chats we would have about how things are going. My condolences to his partner, Angie, and to the rest of Bob's friends and family. NACAT is a better organization because of Bob's selfless contributions, and I feel enormously proud to have known Bob.

Steve Gibson



1955 - 2021



STEVE GIBSON

RIVERSIDE, CALIFORNIA

Time is flying by! We must be having fun, right? I know this school year has been one to remember. Continuing uncertainty about the COVID situation and how it impacts your classroom activities is still a hot topic. I applaud all of you for your determination, creativity, ingenuity, and passion for teaching. In the school district where I live, high schools will resume on campus teaching this coming Monday. There seems to be glimmers of hope that things are beginning to return to normal, and I hope it is the same in your local area.

A few weeks ago, NACAT lost a powerful ally, Bob Chabot. Bob was very active behind the scenes with many recent NACAT projects: NACAT eNews, the design of the new NACAT website, membership and member engagement, just to name a few. Bob did not want any credit for his work, he did everything as a volunteer and out of the goodness of his heart because he LOVED NACAT. I will sincerely miss Bob and the random chats we would have about how things are going. My condolences to his partner, Angie, and to the rest of Bob's friends and family. NACAT is a better organization because of Bob's selfless contributions, and I feel enormously proud to have known Bob and see the fruits of his work.

NACAT has several activities coming up in the remaining weeks of the school year. I hope you will join us for one (or all) of them! We will have technical training sessions as part of our bimonthly eConference schedule, and also an instructor roundtable session with interactive discussion among automotive educators from across the US and Canada. We also have the NACAT election coming up, please watch your email for ballot and voting information. If you don't receive election information, please keep in mind that only active members can vote – many memberships lapsed at the end of last school year, in large part due to the craziness caused by COVID. If you are unsure of your membership status, you can check with [Bill](#) in the NACAT office.

I hope you continue to stay safe and well and I look forward to when we can all gather together again at an in-person conference.



CREATIVITY IS INTELLIGENCE HAVING FUN...

Albert Einstein

Use of Augmented and Virtual Reality in Remote Higher Education: A Systematic Umbrella Review

By: Krisjanis Nesenbergs, Valters Abolins, Juris Ormanis, and Artis Mednis

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Abstract

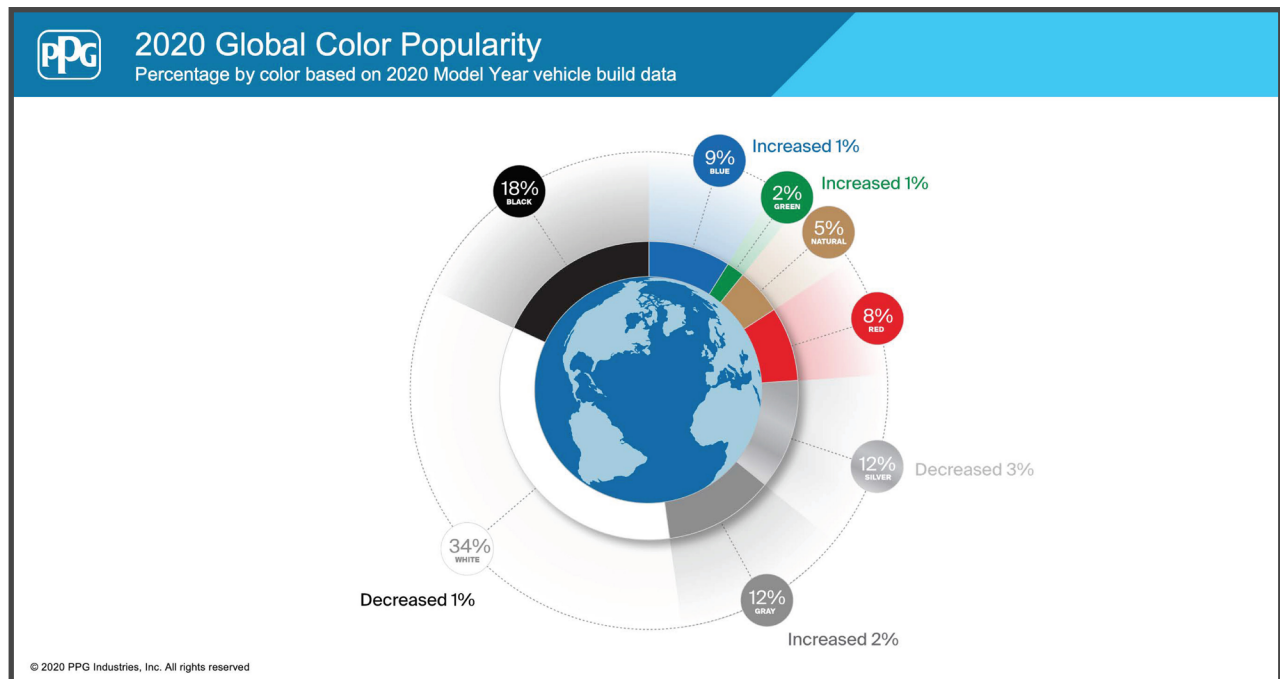
In this systematic umbrella review we aggregate the current knowledge of how virtual and augmented reality technologies are applicable to and impact remote learning in higher education; specifically, how they impact such learning outcomes as performance and engagement in all stages of higher education from course preparation to student evaluation and grading. This review was done as part of a state wide research effort of Latvia, to mitigate the impact of COVID-19 and specifically to provide a framework for a technological transformation of education in this context. In this work we search the Scopus and Web of Science databases for articles describing the use of virtual and/or augmented reality technologies in remote learning for higher education and their impact on learning outcomes. We identified 68 articles from which, after multiple screening and eligibility phases, nine review articles were left for extraction phase in which 30 structural elements with corresponding interventions and measured effects were extracted. Of these, 24 interventions had a measured effect on student performance (11 positive, seven negative, six no impact) and six interventions had a measured effect on student engagement (all six positive).

Introduction

The COVID-19 pandemic has highlighted the need for transformation of remote learning to not only survive a wave of crisis, but to potentially fit the new normal. A trend among governments across the world has been emerging to emphasize the potential for new technologies such as artificial intelligence and virtual/augmented reality to mitigate the problems remote learning has compared to on-site learning, such as academic dishonesty, decreased social aspects of studying, lack of practical kinesthetic interactions, problems keeping students' attention, practice of technological boundaries, etc. As these are complex and expensive technologies, a decision for their use must be based not on technological hype but scientifically validated outcomes.

When it became clear that remote learning will have to be extended after the first wave, the government of The Republic of Latvia initiated a research programme in technological transformation of remote education. This is a 6 months long research programme providing a 500,000 EUR grant to an interdisciplinary team of researchers from multiple research institutions to evaluate how the Latvian society dealt with the coronavirus crisis and to provide recommendations for societal

BLUE AUTOMOBILES TO LIFT COVID BLUES? PPG 2020 AUTOMOTIVE COLOR REPORT SHOWS BLUE HUES MAINTAINING PRE-PANDEMIC GROWTH



Optimistic color conveys trust, dependability, healing, hope

PPG (NYSE:PPG) released its 2020 automotive color popularity report, which shows blue hues continuing to increase in popularity. The optimistic color climbed to 9% of global color share – a 1% increase from 2019.

The trend reinforces PPG's 2019 automotive color forecast, which anticipated that sales of blue automobiles would increase over the next four years. PPG experts believe the global COVID-19 pandemic is likely to further fuel global preference for the color.

"COVID-19 has consumers focusing on their desires and priorities," said Misty Yeomans, PPG color styling manager, Americas. "Blue is an optimistic, comforting color that conveys trust, dependability, confidence, healing and hope. It's also associated with nature, cleanliness and future-forward technology."

While blue held steady in most regions, it increased 1% in Asia-Pacific markets, accounting for virtually all the color's overall global growth. In North America, blues held at 10% of the color share, but became more popular on minivans, compact cars and sports cars. Blue now commands 15% of the sports car segment in the region.

In Europe, blue occupies 11% of the market. Sales of blue luxury, mid-size and sub-compact vehicles grew by 1% across the continent last year. In China, the purchase of blue sub-compacts jumped by 4% and blue mid-size cars by 2%, but the color fell by 6% in minivans.

As the movement toward blue continues, Yeomans expects the color to emerge in more vivid or desaturated shades, deep-sea luxury tones and hues with a slight turquoise influence.

"Digital-inspired aqua-blues combine versatility with a sense of youthfulness and a fresh spirit," said Yeomans.

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Continued from Page 7

resilience in the future. This project has several work packages including study of societal dynamics in Latvia during this crisis, evaluation of labour market and employment structures, psychological effects of COVID-19 on individuals and families, evaluation of media and health communication, strategic communication and governance and finally education transformation. This work is part of this project, specifically the last work package and is aimed at finding evidence of the impact of virtual reality (VR) and augmented reality (AR) technologies on remote learning in higher education—specifically impact on performance and engagement. This is done through a systematic umbrella literature review—a review of literature reviews. This review conforms to PRISMA guidelines. Our research question is defined as "Which interventions using virtual and/or augmented reality technologies for students in higher education in remote learning have measured impact on student performance and engagement" and this question is defined according to PICOS approach in **Table 1**.

Table 1. Research question of our umbrella review defined according to PICOS approach.

P	patients	students in higher education
I	intervention	use of virtual and/or augmented reality technologies in remote learning
C	comparison	none
O	outcome	impact on student performance and engagement
S	study design	systematic reviews

Methodology

In this section we describe the methodology of this systematic umbrella review (see flow diagram

Continued on Page 15

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CURT WARD

JOLIET JUNIOR COLLEGE

Fellow NACAT Members and Friends,

As I sit down to compose this update it has been one year since the classes at our school changed due to the pandemic. When I began my teaching career many years ago I could have never envisioned what our classes have looked like over the past year. Quarantines, remote learning, hybrid labs, and face masks have all been part of my new normal.

I want to begin by congratulating all the current educators who are reading this. You are truly heroes. It does not matter if your classes are being held remotely, in-person, or in a hybrid model, the work you have put forward to meet the needs of our students is extraordinary. I also want to offer my thanks to everyone else who has supported the educators in your area as they work to provide some version of normal to our students during these uncertain times. As the vaccine has begun to roll-out and the positivity numbers begin to go down in our area, my hope is that the fall term will begin to look more like the classes before the pandemic.

As I have shared in some of my online presentations over the past year; I hope you have found items during these challenging times that you can take forward and make your classes better for the future. For myself, I will continue to give all my written assessments in the online format and not waste valuable classroom or lab time with these tasks. The extra few minutes I gain each week may just make the difference between the students understanding a concept or skill, or leaving class with a level of confusion.

During this time of uncertainty the Board and officers have continued to meet virtually and make decisions that make good business sense for NACAT and that continue to serve the needs of our members. Our hope is that the 2020 virtual conference and expo, the bi-monthly instructor roundtables, and the quarterly technical sessions have provided both technical insight and the opportunity to share with one another.

Based on the best medical advice and the feedback we have received on school travel budgets, the Board and officers have made the difficult decision to continue this format through the end of 2021. This means we will be canceling our 2021 in-person conference and expo that was to be held in northern Kentucky in July 2021. We are currently working with all the stake-holders to schedule an in-person event at the same location in 2022. Instead we will continue to hold bi-monthly instructor roundtables and quarterly technical sessions. Additionally, we plan to hold a virtual conference and expo in the July time period. Although this news is disappointing, we hope that this decision keeps everyone safe and well.

Continued on Facing Page

As the Board and officers begin to plan the 2022 event, we would like to know what you, the members, would like to see at our next in-person event. If you have a topic that you would like to know more about, let an officer or Board member know and we will do our best to include it in our planning.

I look forward to seeing everyone at an in-person event when the health crisis is behind us. Until then, stay safe and continue to provide the very best for our students.

GARAGE GURUS® CONTINUES AUTOMOTIVE TECHNICIAN SCHOLARSHIP PROGRAM FOR 2021

Garage Gurus®, the industry-leading training and support platform from Tenneco's DRiV division, will award up to \$30,000 in scholarships to future automotive technicians who are accepted or currently enrolled in accredited, U.S.-based automotive technical schools, colleges, and universities, or enrolled full-time at a U.S. high school. Applications are now available on the [Garage Gurus website](#) for the opportunity to receive one of 12 \$2,500 Garage Gurus Automotive Technician Scholarships for the 2021-2022 school year. All materials must be submitted by April 30, 2021; winners will be announced on or about June 1, 2021.

In addition to the application, students are also required to submit 2 letters of recommendation from non-family members as well as a typed essay or video introducing themselves and indicating "Why I Want to Be a Top Technician." (Applicants must be legal residents of the United States, in the United States on a valid student visa, or possess resident alien status.) All applications and related materials will be reviewed and winners selected by Garage Gurus' team of ASE Master-certified technicians and other team members.

"The service technician is one of the most important people in the automotive aftermarket, and it's no secret that attracting qualified individuals to these positions has been a challenge all throughout the industry," said Dennis Sheran, director, Garage Gurus. "We are committed to addressing the skills gap and technician shortages through our full slate of onsite, online and on-demand training classes and through this scholarship program, now in its seventh year. We hope to be able to inspire and assist those seeking a career in automotive repair."

Offering onsite, online and on-demand instruction, Garage Gurus is a first-of-its-kind national training platform designed to help front-line automotive service professionals keep pace with the latest vehicle technologies. State-of-the-art Garage Gurus technical education centers operate in 11 U.S. markets – Atlanta; Baltimore; Boston; Chicago; Dallas/Fort Worth; New Hyde Park, N.Y.; Rancho Dominguez, Calif.; South Florida; St. Louis; suburban Detroit; and Van Nuys, Calif.

To learn more about the Automotive Technician Scholarship Program, to apply, and to read the full set of rules and eligibility requirements, visit www.garagegurus.tech.

About Tenneco

Tenneco is one of the world's leading designers, manufacturers and marketers of automotive products for original equipment and aftermarket customers, with full year 2020 revenues of \$15.4 billion and approximately 73,000 team members working at more than 270 sites worldwide.

NACAT
MEMBERSHIP
YEAR

SEPTEMBER 1
THROUGH
AUGUST 31

STANDARD MOTOR PRODUCTS LAUNCHES AUTOMOTIVE EDUCATION PROGRAM

Standard Motor Products, Inc. (SMP) has launched the Automotive Education Program (AEP) to assist instructors and help automotive technology students develop professional skills they can use in the bay.

As virtual learning is becoming a welcome addition to classroom instruction, the SMP program offers supplemental training for students, while providing an opportunity for them to earn gifts and help their instructor outfit the classroom. The initial AEP course features a series of four videos that explore ignition coil issues, testing, and tips.

Since its launch in early September, more than a thousand tech students have already participated in Level 1 of the program.

To sign up, instructors create an account and build their class on www.SMPAutoEducation.com. The system generates a unique URL that instructors send to their students, who register and join their instructor's AEP classroom. Upon successful course completion, students receive a certificate and gift package, and instructors receive posters, counter mats, and more for their classrooms.

Commenting on the program, Ryan Kooiman, Director of Training, SMP, stated, "We are pleased that our Automotive Education Program has been so well received and that we're able to support the instructors and students. This is one of the many ways SMP is helping to educate the next generation of automotive technicians."

AEP is expanding into new topics and the level 2 course will be available soon. For more information, visit www.standardbrand.com/en/content/aep.

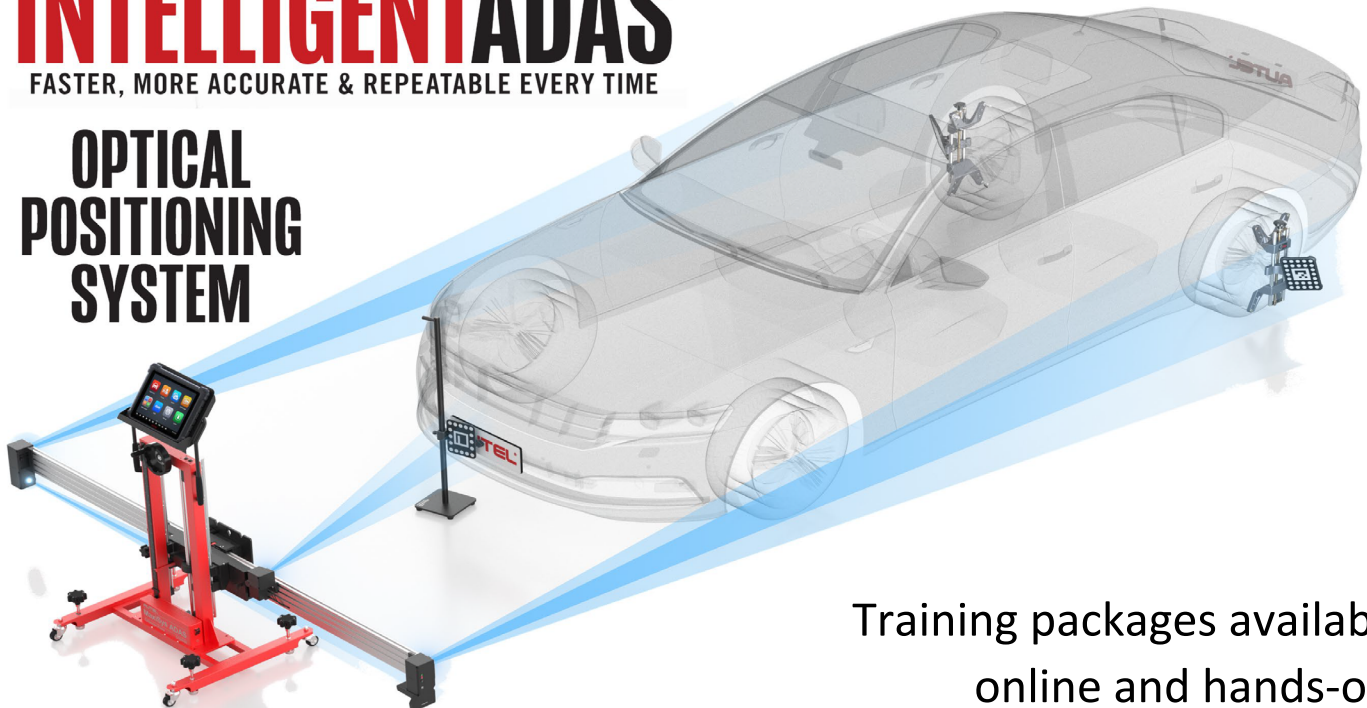
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“The emergence of the electric vehicle (EV) market also will drive growth in vibrant tones and interesting effects, such as color-shifting colors. We’re also seeing blue used more extensively in trim lines, logos and other accessorizing applications.”

Consumer demand and the need to accommodate autonomous driving technologies helped white remain the world’s most popular automobile color. While preference for white tones fell 1% from 2019, solid and metallic shades of the color claimed 34% of the cars purchased worldwide in 2020, according to PPG’s report. This was led by 41% of auto builds in the Asia-Pacific region, which is a boost of 1% from 2019, and 36.5% in South America, where demand fell by 2.5%. In North America, white metallics leapt substantially in the luxury car segment, from 21% last year to 38% in 2020.

“White colors also reflect consumers’ desire for refined simplicity and versatility in turbulent times,” Yeomans said. “In addition to the pearl and metallic whites that are already widely popular, we anticipate a new dimension of white stylings in the automotive market that create a warm, sophisticated feel, such as creamy shades of ivory or bone-colored tints and ceramic effects. White colors are also highly compatible with emerging radar and LiDAR technologies that enable self-driving vehicles.”

Together, green, blue and natural shades accounted for 16% of the global automotive color share. This figure is consistent across all regions except South America, where white, silver, black and gray virtually eliminate these hues.

“Red is consistent and an important color space in the automotive market, holding steady at 8% globally,” said Yeomans. “This color will get a new push with EV start-ups due to its stand-out nature and association with sports car models. Year after year, we see high chromatic reds growing in interest.”

Holding steady at 18% compared to 2019, black retained its popularity as a core color due to its versatility and dramatic design potential.

“Effects and finishes that incorporate black tones allow for artistic reveals in the way color shifts, highlighting hidden undertones and adding a dramatic flair to the possibilities provided by the new pigments and finishes being developed within this color family,” Yeomans said.

Globally, a slight decrease in the popularity of silver was balanced by a corresponding increase in preferences for gray. Silver tones dropped from 15% of auto builds in 2019 to 12% in 2020. Grays rose from 10% to 12% during the same period.

PPG forecasts that gray will remain a popular core color for automotive stylists moving forward, driven by the resurgence of concrete and stone materials and the ongoing appeal of ceramic and metal tones. The gray palette will shift toward warmer hues with brown influences, while blue-inflected grays will retain their fashionability.

The influence from nature will be apparent in silver stylings moving forward as well, according to PPG experts. Warmer and more organic tones will further reflect current consumer tastes, while also aligning with the highly compatible nature of very light tones, including whites, with new radar and LiDAR technologies.

To learn more about PPG’s automotive color popularity report, visit news.ppg.com/2020automotivecolor.

in **Figure 1** for an overview).

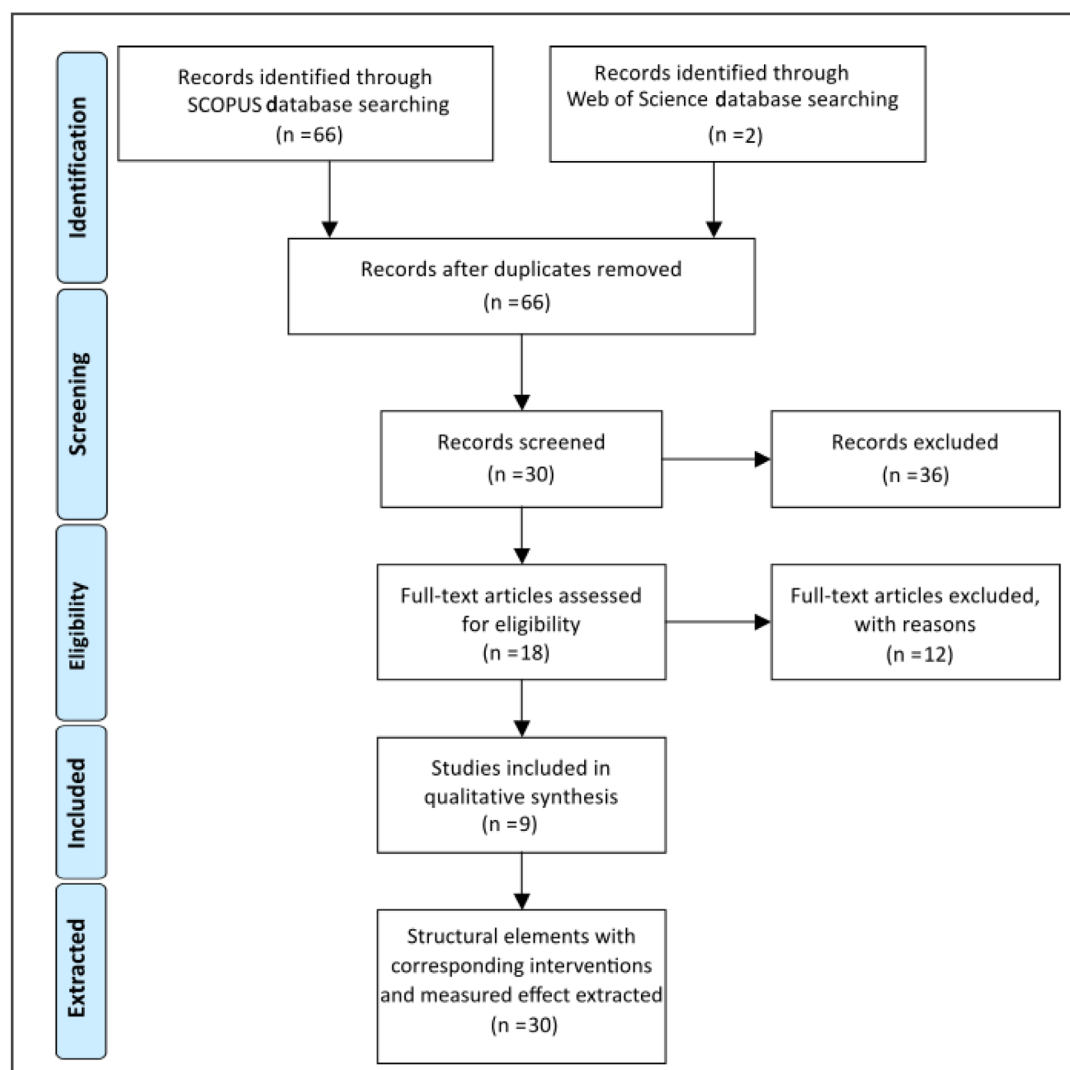


Figure 1.
Systemic Review Flow Chart

This research conforms to PRISMA guidelines with the exception that the review protocol was not registered beforehand due to the time sensitive nature of the funding project related to the pandemic situation.

Identification

To identify the articles for inclusion in the review, a search was conducted in September, 2020 in two databases indexing peer-reviewed articles: Scopus and Web of Science. The scope was defined as “Use of virtual and/or augmented reality technologies in remote learning of higher education and their impact on learning outcomes”. For query results see **Table 2**.

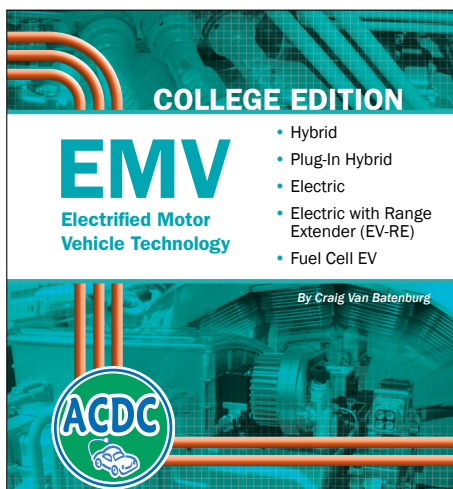
Table 2. Identification search queries and results.

Database	Query	Results
Scopus	TITLE-ABS-KEY ((“Virtual reality” OR “Augmented reality”) AND (((online OR distance OR remote) AND (study OR education OR learning)) OR e-learning) AND students) AND PUBLISHED > 1999 AND (LIMIT-TO (DOCTYPE , “re”))	66
Web of Science	TOPIC: ((“Virtual reality” OR “Augmented reality”)) AND TOPIC: (students) AND TOPIC: ((“e-learning” OR ((“online” OR “distance” OR “remote”) AND (“study” OR “education” OR “learning”)))) AND YEAR PUBLISHED: (> 1999)	2

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TECHFORCE REPORT REVEALS DEMAND FOR VEHICLE TECHNICIANS CONTINUES TO OUTPACE SUPPLY BY NEARLY 3 TO 1

TechForce Foundation® has released its 2020 Transportation Technician Supply & Demand Report, that reveals the transportation technician shortage continues to worsen.

The 2020 Technician Supply & Demand Report supplements the Foundation's previous reports, adjusting prior projections to reflect research from the National Center for Education Statistics and TechForce's own analysis of Bureau of Labor Statistics data. Citing both increasing demand for professional techs and a declining supply of new techs entering the industry, the update concludes that the technician shortage is increasing in severity despite a slight uptick in new post-secondary degrees and certificates for future diesel technicians.

"Although demand is strong, with 642,000 auto/diesel/collision techs needed between 2020 and 2024, the shortage continues to worsen. The good news is these careers have been deemed essential by the government, and the transportation industry is organizing to do something about the shortage," said Jennifer Maher, TechForce CEO. "TechForce's campaigns are leveraging the industry's collective voice to inspire the next generation of technicians and address the root causes of the shortage."

Screening

After removing duplicates 66 articles were screened by reading their titles and abstracts. The screening criteria was:

1. only review articles are included;
2. only articles about higher education are included;
3. only articles using AR/VR technologies are included;
4. only articles about remote learning are included

During the screening process 36 articles were discarded leaving 30 articles for the Eligibility phase.

Out of these 36 excluded articles 16 articles were not review articles, 13 articles were not about AR/VR technologies, four articles were not available, two articles were not in English and one article was not about higher education.

Eligibility

During the eligibility phase, the articles were randomly distributed among the authors for a full text analysis. The eligibility criteria was as follows:

1. The article full text is available in English;
2. The article contains a review of multiple articles;
3. The article is about higher education;
4. The article is about remote learning;
5. The article is about AR/VR technologies.

In this stage 12 articles were excluded as ineligible and 18 articles were deemed eligible for inclusion and data extraction.

Out of these 12 excluded articles 10 were not review articles, one article was not available, and one article was not about higher education.

Included

Finally, the eligible articles were processed to extract all interventions that affect one of two variables: student performance or student engagement.

In this way 30 interventions were extracted. These interventions were then divided by the stage of the remote education process. The following stages were considered:

1. Course design, content planning;
2. Development of digital learning materials;
3. Cognitive load and time management;
4. Remote lecturing and content delivery;
5. Feedback and interactivity;
6. Social involvement, interaction;
7. Remote practice, labs, kinesthetic learning;
8. Remote evaluation.

NACAT MINI CONFERENCE

TUESDAY APRIL 20, 2021

HOW TO TEACH CAN BUS DIAGNOSTICS WITH INFORMATION MOSTLY AVAILABLE AT THE DLC

PRESENTER: AL SANTINI, CONSULAB

THURSDAY APRIL 22, 2021

IMPLEMENTING ADAS IN THE CLASSROOM

PRESENTER: CURT WARD, JOLIET JUNIOR COLLEGE

RELEASE: TECHFORCE

CONTINUED FROM PAGE 16

Recent surveys show an increased interest in transportation technology work, both among younger students and career changers whose jobs may have been lost or furloughed because of the pandemic. Surveys of high school students show that more than half are open to something other than a four-year degree.

According to TechForce Director of National Initiatives Greg Settle, who authored the report, "Our projections do not reflect potential impact from the COVID-19 pandemic. However, we are seeing indications of increased interest in technical program enrollments. With our next report at year-end, we expect to be able to provide further insight into COVID-19 related trends."

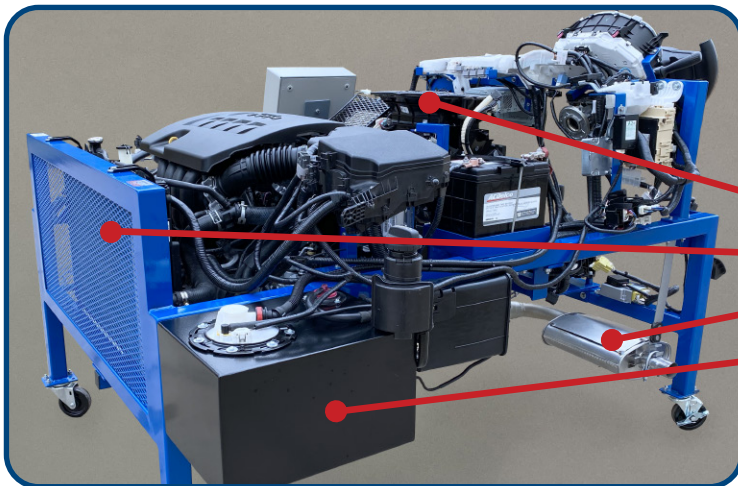
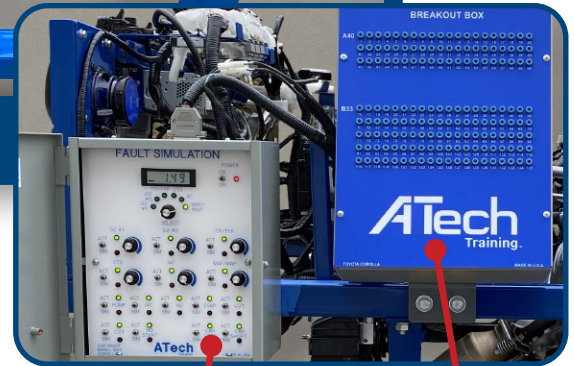
"Despite record rates of unemployment, there continues to be strong demand for our graduates," says Jerome Grant, CEO of Universal Technical Institute. "Employers need skilled technicians to fill essential jobs and, as many in our nation look for new paths to prosperity, we're seeing growing interest in our programs and in technical careers."

You can download the 2020 Technician Supply & Demand Report [here](#). For additional information about secure, successful careers in transportation technology, visit www.techforce.org.



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WRITTEN BY CURT WARD

WHAT TOOLS DO I NEED?

As an individual who has added hybrid and electric vehicles to their curriculum, one of the most common questions I get asked is: What tools do I need in order to add hybrid and electric vehicles to our curriculum? During this time of very tight budgets this question is very understandable. In my very first article on this subject I provided a very high level of overview on the subject. In this article I will attempt to provide specific answers to these questions and provide some other insight as to how we started at my school.

The first area of interest is safety. Every program already mandates that the students must wear safety glasses when they are in the lab. This does not change with hybrid and electric vehicle curriculum. The program or the student will continue to provide this essential piece of safety equipment. The second piece of safety equipment that will need to be acquired is safety gloves. Your program will need a sufficient quantity of "Class 0" safety gloves rated at 1000 volts as rated by ANSI/ASTM (The American National Standards Institute/ American Society for Testing and Materials) and the corresponding sizes of leather gloves that help protect the rubber gloves from damage. Your program will need to setup a process to have the "Class 0" gloves recertified every six months to remain within the standards. At my school we use the same company to test the gloves as the rest of our electrical programs on campus to help reduce costs. Additionally, check with your schools insurance carrier to determine what other safety items would be required. Some additional items might include insulated work mats, insulated shoes, or specifics related to work clothing materials.

The second area of interest is electrical test equipment. The program will need a scan tool with up-to-date software that covers the vehicles you intend to use in the training program. This should not be an additional program expense because it is likely that the scan tools that are currently being used also cover the vehicles being used in the hybrid and electric vehicle curriculum. Note: Do not rely on "code readers" when working on electric vehicles. Most code readers will not communicate with the vehicles modules.

Any multimeter that is used on a hybrid or electric vehicle needs to be category three (CAT III) rated. This includes the meter leads. Most meters and leads are clearly marked if they are CAT III rated. The most important feature of the leads is the shield on the tip of the probe. Make sure it has not been removed. The removal of the shield invalidates the CAT III rating. Some schools like to add an inline fuse to the positive lead of the multimeter to protect the more expensive fuse inside the meter. The addition of the inline fuse also invalidates the CAT III rating of the lead. It is likely that if the school has purchased a quality multimeter in the last couple of years it has the CAT III rating.

A meg-ohm meter or insulation tester will need to be purchased. This meter will be needed to verify the isolation of the high-voltage system from the vehicle chassis. When purchasing a meg-ohm meter or insulation tester, make sure that it is rated for 1000 volts. A traditional multimeter cannot be used as a substitute because it does not have the capability of testing at the higher

Results

In total 68 articles were first identified, of which 66 were left after removing duplicates, 30 were left after the screening, 18 were left after eligibility checks and finally, 9 review articles were included in the final data extraction.

From those articles 30 structural elements and related interventions were extracted that contained AR or VR intervention in remote learning in higher education and had a measured impact on either performance or engagement.

The interventions related to augmented reality (AR) in these results are defined as interactive technology that allows to combine/complement/enhance real-world objects by computer-generated perceptual information on some sort of smart device, while interventions related to virtual reality (VR) are defined as technology that allows to simulate real-world objects, events and interactions in digital computer generated domain/world/environment. Usually, VR term is used to describe virtual reality experience that could be obtained using VR-Headset, but in this paper VR term is used in a broader sense. The VR term also includes virtual laboratories on mobile devices or PC for experiments demonstration and performance.

In these interventions the impact on performance refers to observed change or no change to either the efficiency of accomplishing assignments, cumulative grade obtained during course or a metric that represents student ability to accomplish given task, using previously obtained knowledge. The impact on engagement refers to change or no change to the tendency of students to participate in study process, student enjoyment, satisfaction and feel of meaningfulness of ongoing process, willingness of students to attend classes, participate in in-class/after-class, course related, activities and interest in obtaining of additional materials.

Specifically 24 interventions described measured impact on performance (of those 11 had a positive impact, 7 had a negative impact and 6 had no effect) and 6 interventions described measured impact on engagement with all 6 reporting positive impact.

The education stage with the most identified interventions was “Remote practice, labs, kinesthetic learning”. There was one stage without any matching interventions-“Development of digital learning materials”. In 6 out of 9 reviewed papers VR/AR technologies were used in the field of medicine. Other fields where VR/AR technology was used were engineering, physics, chemistry. In two papers the field wasn’t specified and it was used for study purposes. The following percentages of review articles and original articles contained use of AR/VR technologies for the specific stages of remote educational process: Course design, content planning 11/2%, Development of digital learning materials 0/0%, Cognitive load and time management 11/8%, Remote lecturing and content delivery 11/6%, Feedback and interactivity 11/4%, Social involvement, interaction 11/8%, Remote practice, labs, kinesthetic learning 89/63% and Remote evaluation 11/8% respectively.

The identified interventions together with the intervention stage, intervention value, intervention effect, review article in which the intervention was identified and list of original articles supporting the intervention results can all be seen in the results in **Table 3**.

FordTechMakuloco

<https://www.youtube.com/user/FordTechMakuloco/videos>

This is your source for anything Ford related. It covers repairs, upgrades, modifications, maintenance, news, and best practices to help you fix a Ford. The owner of the channel was given the ultimatum to shut down his YouTube channel to keep working at the Ford dealer, so he quit and went independent.

Go Tech Technical Specialists

https://www.youtube.com/channel/UCt2U5SZn_m2dtolft_O3DHQ

This channel covers vehicle electronics & drivability training.

Precision Transmissions

<https://www.youtube.com/channel/UCYAAAY7V9ifGS7Q8S35EFVnw>

This channel covers all types of transmission teardowns/builds from start to finish.

ScannerDanner

<https://www.youtube.com/user/ScannerDanner/featured>

Paul Danner is an instructor at Rosedale Technical Institute. His specialty is drivability and chassis electronics. Paul also has training material for sale.

South Main Auto Repair LLC

https://www.youtube.com/channel/UCtAGzm9e_liY7ko1PBhzTHA/featured

Eric O runs an automotive repair shop in upstate New York. While Eric does a lot of diagnostics, he also does a lot of brake and suspension work which is challenging due to the heavy use of road salt in his area.

Super Mario Diagnostics

<https://www.youtube.com/channel/UCaNH77hSGAZ5vF45hv6FpmQ/featured>

Mario specializes in the over the shoulder style videos. He puts on a head mounted mic, grabs a camera, and takes the viewers along for the diagnostic journey.

Voltage Drop Diagnostics

https://www.youtube.com/channel/UC_HeAAKRilHUy08RwlHizoA/featured

Patrick works at a Toyota dealership and posts some of the more unusual Toyota issues.

Engineering Explained (Advanced Discussions)

<https://www.youtube.com/user/EngineeringExplained>

Jason is a mechanical engineer that delivers very high end discussions about emerging technologies. He started his YouTube channel while in college using whiteboard drawings and still uses a whiteboard to explain complex automotive systems.

Flat Rate Master (Shop Operations)

<https://www.youtube.com/channel/UC8soFWRYXUoE6IIT16BrEZg/featured>

Michael is a shop manager at a large independent shop in Atlanta GA. He covers the challenges of managing a shop along with tool reviews.

Banks Power (Turbochargers)

<https://www.youtube.com/channel/UCs50EmjtJyNLDcgTGSVNvcQ>

Gale Banks, with over 60 years of breakthroughs in high-performance gas and diesel turbocharger development, has no rival. His videos cover this topic at a higher level than any other channel.

Table 3: Extrated structural elements with corresponding interventions and measured effect.

No.	Stage	Intervention	Variable	Effect
1	Course design, content planning	Use of AR technologies with insufficient pedagogy training	Performance	Decrease
	Development of digital learning materials	-	-	-
2	Cognitive load and time management	Usage of complex AR simulations for students, who are not familiar with this complex technology, leading to confusion and astoundment	Performance	Decrease
3	Cognitive load and time management	Use of AR with insufficient support that can confuse learners and delay the learning process	Performance	Decrease
4	Cognitive load and time management	Unassisted AR experience with high load/complex course leading to cognitive overload	Performance	Decrease
5	Remote lecturing and content delivery	Use of AR in lecturing and content delivery improves focus, attention levels, study process becomes more enjoyable , fun and satisfying	Engagement	Increase
6	Feedback and interactivity	Use of AR for calculus and abstract concept visualisation promotes mathematical and cognitive skills in engineering students	Performance	Increase
7	Social involvement, interaction	Use of AR for better face-to-face and remote interactions and collaborations	Engagement	Increase
8	Social involvement, interaction	Use of AR enables interactions and collaborations which are more similar to natural face-to-face collaboration than screen-based interaction	Engagement	Increase
9	Social involvement, interaction	Use of AR in academic settings improves learners' motivation and engagement, especially when game-based approaches are utilized	Engagement	Increase
10	Remote practice, labs, kinesthetic learning	Use of AR had positive influence on learning rate and memorization process of medical students	Performance	Increase
11	Remote practice, labs, kinesthetic learning	Use of AR increases motivation, engagement, interest and knowledge retention	Engagement	Increase
12	Remote practice, labs, kinesthetic learning	Use of virtual worlds promotes student motivation and engagement	Engagement	Increase
13	Remote practice, labs, kinesthetic learning	Use of virtual worlds promotes spatial knowledge and capability to transfer the knowledge to real world skills	Performance	Increase



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THE AUTOMOTIVE INDUSTRY FACES UNPRECEDENTED CHANGE - THE NEUTRINO ENERGY GROUP

In Germany, the Neutrino Energy Group believes it has developed the next stage in alternative automotive technologies with the Car Pi, a new type of automobile that solely uses the power of neutrinos and other electromagnetic radiation for its operation.

While automobiles that use fossil fuels are inherently unsustainable, the lack of viable alternatives has led the world to turn its eyes away from this reality. The rise of electric car manufacturers like Tesla, however, has forced greater attention to events like the German diesel scandal of 2019, drawing consumer and investor focus to massive changes that could soon rock the global automotive market.



The Car Pi Will Change the Auto Industry More Than Tesla

Germany has long been known as one of the world's epicenters of automotive engineering. However, there are rapidly shifting standards within the automotive market. As the 2019 diesel scandal makes clear, complying with ever-tighter emissions regulations naturally incentivizes mass-scale deception, and automobiles that use internal combustion engines are increasingly threatened by electric cars produced by Tesla and its competitors.

In the Car Pi we have an automotive technology that simultaneously serves as an alternative to Tesla's rechargeable batteries and blows internal combustion technology out of the water.

The Power of the Car Pi Has No End

The [Neutrino Energy Group](#) chose the name "Car Pi" due to the endless nature of the value of pi. Just as the digits of this value go on forever, so will the revolutionary energy technology included in the Car Pi endlessly propel this unprecedented automotive innovation.

In 2015, it was discovered that neutrinos have mass, indicating that these ethereal "ghost particles" can also be harnessed for electrical energy. The first demonstration of neutrinovoltaic technology took place in 2017, proving that it's possible to derive electricity from the kinetic force. Micro vibrations at nanoscaled doped graphene structured at the right geometry and shape are the key. Implemented in automobiles, neutrinovoltaic power will initially supplement existing battery technologies and eventually eliminate the need for batteries altogether. Combined with the incorporation of lightweight materials into compact automobile frames, the innovative energy technology behind the Car Pi will eventually instate a new paradigm of zero-emissions vehicles that never have to be recharged.

The Latest German Automotive Revolution Will Change the World

Yet again, one of the greatest revolutions in automotive technology will emerge in Germany. However, Holger Thorsten Schubart, the visionary philanthropist behind the Neutrino Energy Group, won't be doing it alone. Relying on partners in the United States, India, and beyond, Schubart is building an international coalition of like-minded scientists and engineers who will make the Car Pi into a reality.

There's no reason that the automotive market should slack just because our current technologies aren't up to the task. Innovation will always light our way forward.

CONTINUED FROM PAGE 20

voltage range. Even though it was a little more expensive, I chose a Fluke model 1507 meg-ohm meter for our program because the positive meter lead has a button to trigger a reading. This makes it easier to get a reading using the “one hand” method which further facilitates a safe working environment.

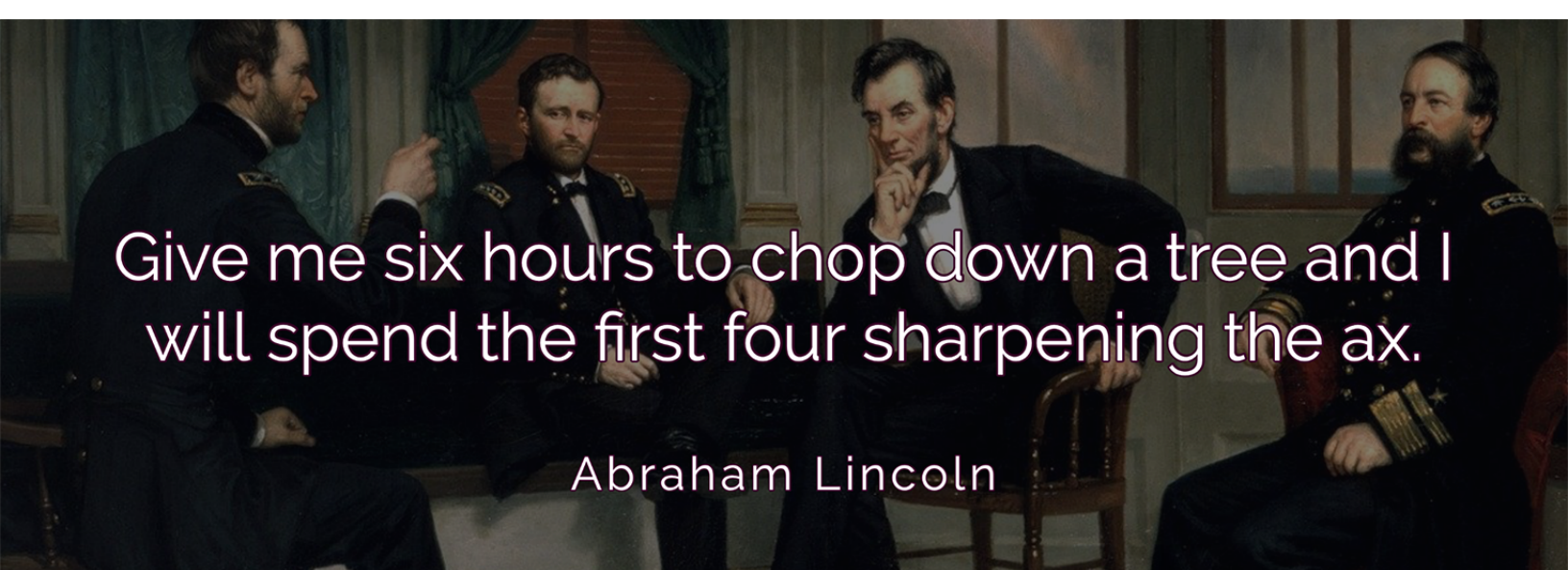
If your curriculum is going to include the testing of electric motors you will need to purchase a milli-ohm meter. A traditional multimeter is not accurate below 1 ohm and most windings on electrical motors have a specification well below 1 ohm of resistance. The typical milli-ohm meter must be plugged into a power outlet and the meter and the component being tested must be warmed to room temperature for test results to be accurate. Our program purchased an Extech Instruments model for less than \$400.00 and has been very happy with the results.

The final item I would include in the category of electrical test equipment is a hand-held automotive grade thermal imaging camera. Many programs already have one of these tools for their general electrical classes. It is a great tool for locating short circuits, ignition off-draw, and areas of high resistance. A good quality unit can be acquired for \$150.00 to \$250.00. Flir makes a model that is very popular with many programs.

The third area of interest that needs to be addressed is general service tools. These tools are going to be very dependent on the vehicles that you have in your training fleet.

Battery Removal: The tools that will be needed to remove the battery are dependent on the vehicle. An electric vehicle may require a substantial fixture to support the battery when it is lowered from the vehicle. A hybrid vehicle may require a much smaller lift if the battery is simply lifted from the rear storage area of the vehicle. Refer to the manufacturers recommendations. In many cases the program does not have to purchase OE tools. Many aftermarket tools are available on higher volume vehicles.

CONCLUDED ON PAGE 28



Give me six hours to chop down a tree and I will spend the first four sharpening the ax.

Abraham Lincoln

Table 3: Continued...

14	Remote practice, labs, kinesthetic learning	Use of VR for interactive presentation and visualization of complex physical experiments has positive effect on learning process	Performance	Increase
15	Remote practice, labs, kinesthetic learning	Virtual worlds are as effective for learning as the more traditional Human Patient Simulator	Performance	Increase
16	Remote practice, labs, kinesthetic learning	Use of virtual labs in physics and chemistry is as efficient as traditional labs	Performance	No change
17	Remote practice, labs, kinesthetic learning	Use of virtual partner simulation for medical students reduced performance	Performance	Decrease
18	Remote practice, labs, kinesthetic learning	Use of virtual partner simulation for medical students didn't change the performance	Performance	No change
19	Remote practice, labs, kinesthetic learning	Use of VR for medical students leads to faster mean completion time, lower directional error in Flexible Sigmoidoscopy	Performance	Increase
20	Remote practice, labs, kinesthetic learning	Use of VR simulation for medical students reduces the mean score and the number of individually completed retroflexion cases	Performance	Decrease
21	Remote practice, labs, kinesthetic learning	Use of VR simulation for medical students did not change the average task time and patient satisfaction	Performance	No change
22	Remote practice, labs, kinesthetic learning	use of VR simulation for medicine students in flexible sigmoidoscopy increases patient comfort level	Performance	Increase
23	Remote practice, labs, kinesthetic learning	Use of VR simulation for medical students in flexible sigmoidoscopy did not change procedural skills such as independence, identifying pathology, landmarks, performing biopsies, adequate visualization	Performance	No effect
24	Remote practice, labs, kinesthetic learning	Use of VR simulation for medical students improves colonoscopy capabilities	Performance	Increase
25	Remote practice, labs, kinesthetic learning	Use of VR simulation for medical students made student Esophagogastroduodenoscopy capability worse	Performance	Decrease
26	Remote practice, labs, kinesthetic learning	Use of VR simulation for medical students improved student Esophagogastroduodenoscopy capability	Performance	Increase
27	Remote practice, labs, kinesthetic learning	Use of VR simulation for medical students improved endoscopic retrograde cholangiopancreatography (ERCP) capabilities	Performance	Increase

CONTINUED FROM PAGE 26

Brakes: In many cases routine service of pads and shoes will require the deactivation of the brake system prior to beginning work and the enabling of the system after the work is complete. The deactivation is generally performed with a scan tool or depowering the brake system by removing relays or fuses. If wheel cylinders or calipers are replaced a pressure bleeding system is required for some models. Our program chose a system that is offered by Mityvac that covered many different models.

Coolant Service: In order to properly service the multiple cooling systems on hybrid and electric vehicles it is likely the program will need a vacuum lift system to ensure all the air has been removed from the system and that it is full of fresh coolant. It is likely that the program already has a compatible system because so many non-hybrid and non-electric vehicles require the same tools.

What about insulated hand tools? Many programs are worried about the cost of insulated tools. Very few insulated tools are required. When the systems are properly depowered, very few procedures require these tools. For our training fleet we have purchased two screw drivers, two types of pliers, a ratchet, an extension, and four sockets. This small number of insulated tools meets all the requirements for our training fleet.

My hope is that the cost of acquiring tools to service a hybrid and electric training fleet is not the reason the program chooses not to add this subject to the curriculum. With a few exceptions many programs already have most of the tools in inventory. The cost to add the remaining tools is relatively low. If you have any specific questions about tools or our experience with them, feel free to reach out to me at curt@curtward.net.

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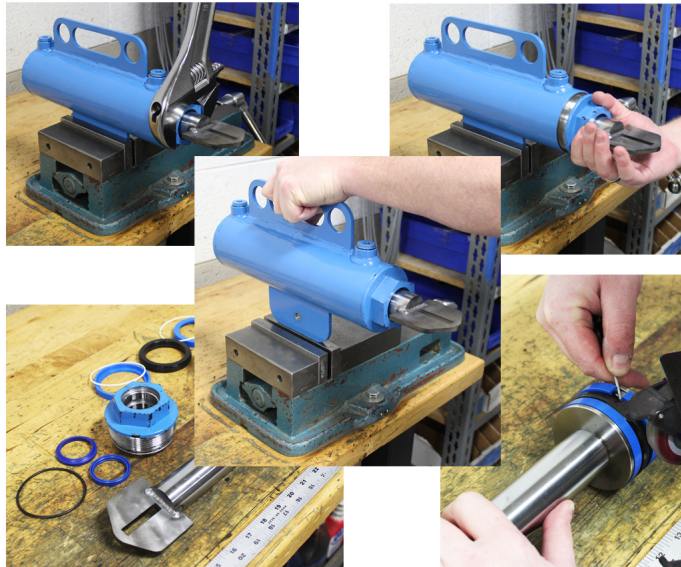
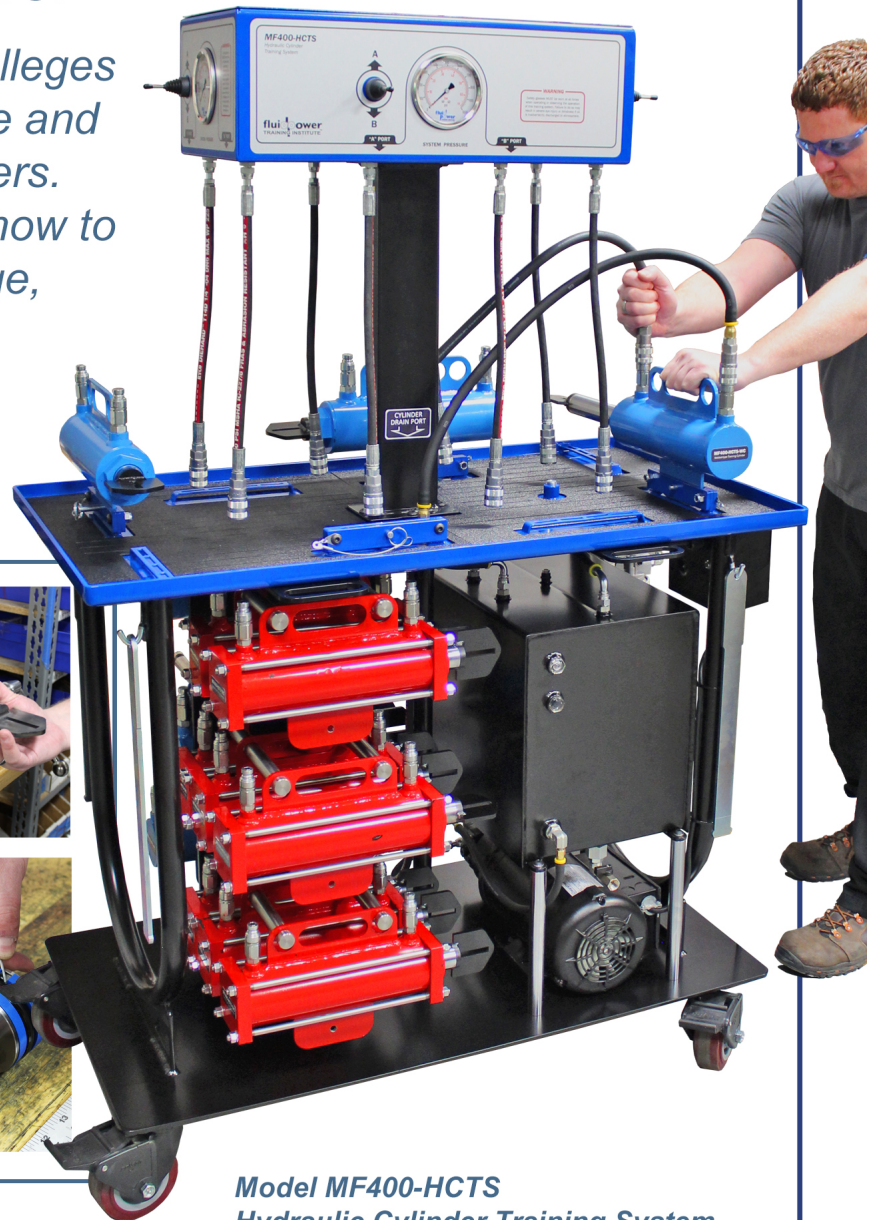
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NACAT INSTRUCTOR ROUNDTABLE

THURSDAY APRIL 15, 2021

Topic:

How Will Educators Fulfill Their Continuing Education Needs in the Future?

Moderators:

Jason Bronsther &

Tom Millard

Article: Umbrella

Continued from Page 27

Table 3 Continued...

28	Remote practice, labs, kinesthetic learning	Use of VR simulation for students - nurses shows that after investment in training new intermediary students and a group of experts had equivalent performance	Performance	Increase
29	Remote evaluation	Use of VR in remote evaluation is able to discriminate between expert and novice performers	Performance	No change
30	Remote evaluation	Computer based simulations and virtual standard patient examinations were unable to distinguish between different experience levels	Performance	No change

Discussion

In order to determine if AR/VR technologies might be beneficial to technological transformation of remote learning, in this article we describe an umbrella review of related literature.

The main limitations of the review are the inability to access 5 of the identified articles and inability to properly analyze 2 identified articles which were not in English.

U.S. AIR FORCE FUNDS ADAPTATION OF AUTOMOTIVE RADAR FOR AUTONOMOUS "FLYING CARS"

[Metawave Corporation](#) has been awarded a prime, Phase One contract by the United States Air Force (USAF) to provide a high-precision, all-weather sensing solution for electric Vertical Take-Off and Landing (eVTOL) aircraft. The initial Metawave study outlined by the contract will identify modifications needed for the company's existing ["SPEKTRA" radar](#) for aerial operations, all of which will be applied to development of next-generation eVTOL air-vehicles.

The USAF's AGILITY PRIME initiative seeks to advance the development of applicable technologies for [operational, human-rated eVTOL aircraft by 2023](#). In addition to traditional aerospace companies, the Air Force is directly engaging with innovative new sector entrants, such as Metawave, that have demonstrated their ability to provide "enabling technologies" that will advance the requirements of AGILITY PRIME.



Metawave's SPEKTRA is a compact analog antenna system that has provided the automotive industry with high-precision radar capabilities accurate out to 330 meters. The current long-range high-resolution SPEKTRA analog radar design enables critical features for next-generation cars, including adaptive cruise control, lane change assist, and automated emergency braking. Based on the level of precision required to safely deliver these features in all-weather conditions, SPEKTRA is an excellent candidate for a rugged sensor system for future eVTOL aircraft, and will enable precision eVTOL navigation and obstacle avoidance.

As part of this Phase One effort, Metawave, in partnership with the Arizona State University Center for Wireless Information Systems and Computational Architectures, will modify the SPEKTRA radar for longer ranges and navigation in three-dimensional (3D) space.

Maha Achour, CEO and founder of Metawave, said the requirements of the aerospace application are a natural extension of SPEKTRA's current capabilities extending high-resolution imaging radars to Ariel Vehicles.

"Both the automotive and eVTOL markets require the highest level of precision delivered by SPEKTRA," Achour said. "For both applications, the ability to reliably distinguish between several objects close together in all weather and light conditions is an important capability for all phases of transport, including flight. The most significant difference is the operational range of the radar."

The AGILITY PRIME initiative was launched by AFWERX, the new rapid innovation branch of the Air Force. AFWERX is devoted to quickly fielding emerging commercial technologies for a variety of future-facing applications. AFWERX's eVTOL project is its [biggest program to date](#), awarding \$38M thus far to more than 250 selected proposals for aircraft and flight-enabling technologies.

The Washington, DC-based start-up company Rhea Space Activity (RSA) worked with Metawave to develop the SPEKTRA concept as a parallel application for its well-established commercial automotive uses. RSA identified SPEKTRA's two-dimensional (2D) solid-state beamsteering and all-weather operational capabilities as uniquely suited to solve several problems related to providing eVTOL aircraft with reliable situational awareness.

FUTURETECH AUTO OPENS REGISTRATION FOR 2021 VIRTUAL AUTOMOTIVE SOFTWARE & ELECTRONICS FUNDAMENTALS BOOT CAMPS

The Boot Camps include a Student Project Kit, pre-scheduled instructor-led virtual training sessions, self-study assignments, quizzes, and a Capstone Project.

The ASE award-winning Automotive Software & Electronics Fundamentals Boot Camp is now available as a virtual instructor-led lecture & hands-on training course. The boot camp is a blend of scheduled training with a live instructor and self-study in an online format, with student project kits that are shipped directly to the participants after enrollment (prior to the first session). The format is meant to mirror the classroom experience, and participants can expect the same rigor and one-on-one attention with course developer and instructor [Dr. Mark Quarto](#).

The boot camp will teach learners how to quickly create circuits and code software to build their own diagnostic tools or training aids. They will also learn how to control advanced vehicle systems for the purpose of diagnosing real (or simulated) problems. Automotive service professionals will develop skills to create simulators, demonstrators, and will also learn how simple electronic and software circuits can be used with the Scan Tool to develop circuits that can make complex diagnostics easier.

The course includes approximately 32 hours of instructor-led group sessions, 27 hands-on assignments, 12 quizzes, and a course capstone project. Participants will receive a project kit with all tools, components, and supplies required to participate in the Boot Camp.

Participants in the 2021 Virtual Boot Camps can choose between 3 “tracks”, or pre-scheduled lessons that revolve around the instructor-led group sessions. The tracks available in 2021 are as follows:

- [Track 1](#): May 4 – August 5, 2021 (3:00PM PDT instructor-led training start time)
- [Track 2](#): May 4 – August 5, 2021 (6:30PM PDT instructor-led training start time)
- [Track 3](#): August 24 – December 2, 2021 (4:00PM PDT/PST instructor-led training start time)

Detailed information about each track is available at [Access OnDemand](#), or by visiting the FutureTech Auto [website](#).

Additional student kits for adaptation into high school, college, and trade education curriculum are available to educators who have completed and passed a hands-on or virtual boot camp ([contact FutureTech for a quote](#))

Information about the Intermediate Virtual Boot Camp and scheduling for 2022 are forthcoming. Those who are interested in hosting a boot camp or requesting a private Virtual Boot Camp Track can [contact FutureTech Auto](#). Bulk discounts are also available.

About [FutureTech Auto](#): FutureTech Auto is a leading supplier of Vehicle Electrification technology solutions to the automotive aftermarket. Services include scalable Hybrid & Electric Vehicle diagnostic equipment and support systems, hands-on training, On-Demand training online, and aligning clients with VE professionals for consulting and special projects.

The results show that most of the current experiments pertain to organizing laboratory or practical exercises within virtual or augmented reality in cases when physical presence is not feasible. This overall seems to provide positive results, except for a few cases [28,32,44]. In cases where practical, spatial or kinesthetic skills are required the results were very encouraging, especially in medicine related education [23,30,52].

In addition to the specific results extracted, the literature also suggests that virtual/augmented reality is not capable of completely replacing on site studies, because whenever it was tried, the student grades suffered [32,44].

As can be seen in Table 3 in multiple studies the mere fact of VR/AR usage already created an impact on performance or engagement. This could be explained by multiple mechanisms, the three more plausible ones are (a) either the AR/VR technologies actually impact the learning process directly, or (b) they impact the outcomes indirectly e.g., these technologies might improve social contact, which in turn improves overall outcomes or (c) the result might be due to a novelty and thus diminish in time as well as stop functioning if new novelty technique is introduced. The latter can only be distinguished if the same group of students is followed through several semesters.

The fact that in all interventions where engagement was measured, the engagement increased, leads us to speculate that novelty of technology used has a direct positive impact on engagement. If this is the case, it means that novelty itself is a potential intervention, and any newly hyped technology could provide similar results. If this is true then another question should be researched—whether there exists a cumulative novelty resistance and whether it accumulates for a person in general with any novelty, or just a subset. Does “acumulative novelty resistance”—the effect when introducing next new technology to study process with purpose of increasing the engagement and/or performance of students—have any effect due to satiation.

The possibility of such novelty requirements could lead to future experiments to determine the best way to keep the engagement and performance of students until the end of the study year.

In every study that showed increase of performance or engagement, the course was well designed and teachers had good qualification to use benefits of AR/VR for learning purposes, however, AR/VR is not a panacea. In cases when students or teachers were not familiar with AR/VR technologies or when courses were not adapted well for AR/VR usage or when teacher of the course was not prepared enough to work with AR/VR, a notable decrease in performance was noted in the articles explored [2,3,4,5,6,28,32,44]. This leads to a highly vital conclusion—an unprepared teacher can't prepare a student well.

The potential solution is:

1. create courses for teachers and lecturers on how to prepare/adapt courses for AR/VR;
2. create a framework that would allow teachers easily prepare/adopt their material for AR/VR;
3. Do not overload students with need to get familiar with AR/VR in a short time. there should be a possibility to use classical methods to get through the course;

At the same time AR/VR proved that it could help to understand abstract and complex content more easily due to good visualisation capabilities and interactivity. In multiple of the reviewed articles it was shown that kinesthetic learning, when instead of a classic lecture, students are working in 3D world, performing experiments alone or together with a teacher, is much more efficient than, previously mentioned, classic method [10,11,16,17,18,20,24,30,31].

With SPEKTRA nearing commercial operation, RSA suggested AGILITY PRIME as a good fit for further development of the radar system's capabilities.

Shawn Usman, astrophysicist and Founder of RSA, said that adaptation of driverless car technologies could be used for a variety of national security applications.

"Rapid technological innovation in the U.S. driverless car sector is also demonstrating remarkable compatibility with the high-performance requirements of many Department of Defense missions," Usman said. "SPEKTRA in particular is versatile enough to support unmanned VTOL operations as well as fixed-wing flight. By guiding small yet highly innovative companies like Metawave through the complexities of programs such as AFWERX, RSA plays a crucial cooperative role in developing core technologies, like SPEKTRA, to push the boundaries of current consumer-facing innovations, while helping to solve critical national security issues."

Following the completion of Phase One, Metawave will apply for a Phase Two contract to bring operational radar hardware to USAF personnel. The Phase Two effort will include a series of field tests of the proposed design array under a variety of varied situations and environments.

SPEKTRA's high angular resolution enables it to distinguish between objects right next to each other (such as a car and a biker). Its narrow beams in the analog domain enable it to quickly detect objects in the vehicle's field of view (FoV) with very high accuracy, while avoiding interference. SPEKTRA's focused beams and small cross-sections allow it to detect objects, such as pedestrians and road hazards, at long ranges and in all weather conditions. The narrow beam and high angular precision of the system also allow SPEKTRA to track cross-traffic, a difficult problem for traditional radar.

About Metawave Corporation

Metawave SPEKTRA™ is the first automotive, analog beamsteering radar capable of distinguishing between objects that are next to each other, in difficult driving scenarios and in all-weather conditions, making cars safer and smarter. Founded in 2017, Metawave is headquartered in Palo Alto and has state-of-the-art labs in Carlsbad and Palo Alto, CA. Visit us at www.metawave.co, email us at info@metawave.co, and follow us on Twitter @metawavecorp, LinkedIn, and YouTube.

About ASU's Center for Wireless Information Systems and Computations Architectures

ASU's Center for Wireless Information Systems and Computational Architectures (WISCA) is directed by Prof. Daniel W. Bliss. WISCA has 25 affiliated faculty that cover a broad range of capabilities that include; system development; information and estimation theory; algorithm development; signal processing and machine learning; hardware development; system-on-chip design; and experimental demonstrations. WISCA's current research topics include statistical signal processing, adaptive multiple-input multiple-output (MIMO) wireless communications, distributed coherent systems, positioning, navigation, and timing, full-duplex relays, MIMO radar, radio network performance bounds, geolocation techniques, channel phenomenology, small-scale radar applications, machine-learning approaches for limited datasets, RF convergence, and signal processing and classification for anticipatory physio-logical monitoring.

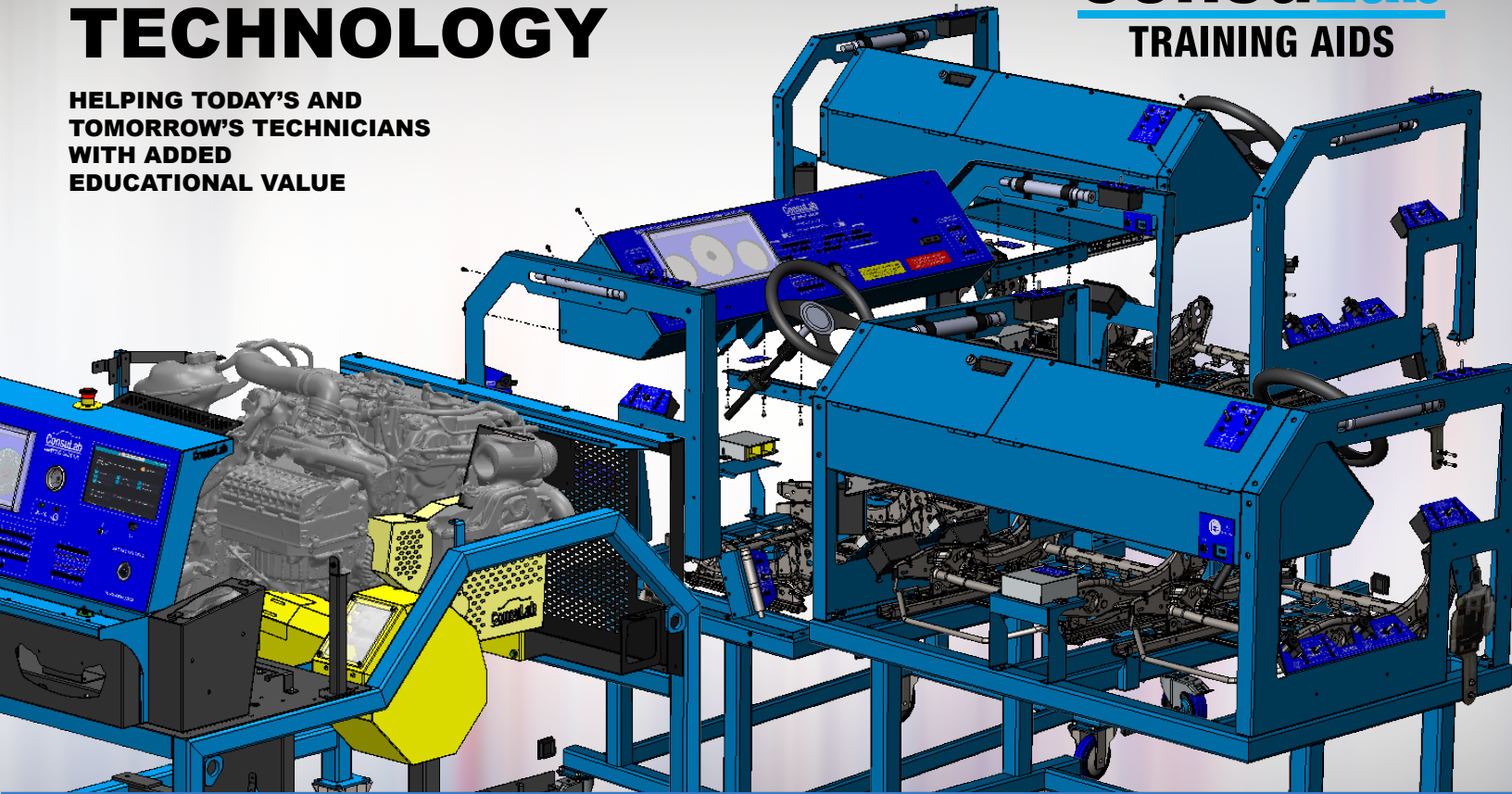
About Rhea Space Activity

Rhea Space Activity (RSA) is an astrophysics start-up company in the science and technology industry. Specifically, RSA ideates and creates high-risk/high-reward R&D concepts to support U.S. national security objectives. RSA has developed various technologies in the fields of infrared satellites, directed energy, artificial intelligence, LIDAR, astro-particle physics, small satellites, cislunar operations, intelligence collection, autonomous underwater vehicles and for the F35 Lightning II.

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HELPING TODAY'S AND TOMORROW'S TECHNICIANS WITH ADDED EDUCATIONAL VALUE

ConsuLab
TRAINING AIDS



Article: Umbrella

Continued from Page 33

The creation of AR/VR adopted courses could have a great effect on knowledge availability. An opinion in the educational community and society at large that has been reinforced by the 2020 lockdown, is that online learning currently could be the future of education. If this is the case, then based on the fact that multiple papers show that AR/VR labs are of similar benefits as traditional "offline" labs with real equipment [24,26], it could be argued that properly adopted AR/VR based courses could, potentially, rise good, qualified specialists all around the globe, not only in local regions, democratizing education in hands on skills.

The performance is not the only factor that we need to take into account, emotional wellness is at least as important, as performance in terms of grades. Scientific groups that were researching Virtual Worlds as substitution for university environment showed that students feel much better if they could see their avatar in some virtual world, they could associate with, walk around virtual campus and explore it, like it would be real university [12,13].

It also must be noted that VR is still relatively complex and expensive technology and even though the prices are going down, still outfitting each student with VR/AR systems for remote learning is a complex and expensive task, which suggests that some of the future remote learning could happen from semi-centralized labs outfitted with VR/AR technologies, where students could arrive to work, but educators would connect remotely.

References may be viewed by clicking <https://www.mdpi.com/2227-7102/11/1/8/htm>.

4 INDUSTRY LEADERS LAUNCH WOMEN OF COLOR AUTOMOTIVE NETWORK

Four auto industry leaders, representing different segments of the retail car business, have teamed up to create the Women of Color Automotive Network.

Launched earlier this month, WOCAN aims to “attract, support, connect and empower women of color in the automotive industry,” through a variety of educational, career and community resources for its members.

That includes monthly webinars, an online private networking group, mentorship program, scholarships, regional events and job postings.

Leading the charge are four auto industry veterans who founded the network:

- **Patrice Banks**, founder and chief executive officer of the Girls Auto Clinic service repair shop
- **Amanda Gordon**, founder and CEO of the Gojo Auto independent car dealership
- **Erikka Wells**, a sales and service marketing manager in the retail auto space
- **Kerri Wise**, vice president of an automotive online marketplace

In a news release, the organization emphasizes that, “Women of color sit at the intersection of gender and race and face unique challenges in their careers. The auto industry represents a significant opportunity for career advancement and financial prosperity.”

However, WOCAN shared that women of color (Black, Latina, Asian, Native American and Pacific Islander) represent just 6% of the U.S. auto industry, even though they comprise 18% of the workforce.

Each of the WOCAN founding board members shared some perspective in the news release:

- “It’s hard to be it, without seeing it. We want to expose women of color to other successful women in automotive who look like them, and also bring awareness to the various automotive career paths,” Gordon said.
- “Being ‘the only one’ can be isolating, intimidating, and can cause you to question if you belong. There were many times where I considered quitting the industry. But if I’m not willing to break barriers, who else will?” Wise said.
- “It was challenging to find a network in automotive that provided a safe place to address the unique challenges I face as a woman of color. Sometimes you have to create what you want to be a part of. So, we created WOCAN,” Banks said.
- “Diversity is a business decision and businesses that have a workforce that match its customer base have a competitive advantage,” Wells said.

For more information, visit www.wocautonetwork.com.

2021 NACAT ELECTIONS

To run for NACAT Vice-President / President-Elect (4 year commitment)
or as a NACAT Board Member (3 year commitment) from the 2021-2022
membership year, please email Pete Kaufmann at
Pete.Kaufmann@nacat.org

Voting will take place in July 2021.

Article: SWAIM

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Papadakis Racing (Racing)

<https://www.youtube.com/user/PapadakisRacing/featured>

Stephan Papadakis offers an insight into high performance systems. He does an excellent job of explaining the hows and whys of the racing world.

Scott Brown (Advance Topics/ ADAS)

<https://www.youtube.com/user/scott73n4u/featured>

Scott was one of the founders of iATN and also owns an independent shop in CA. Scott is definitely an industry influencer and produces a log of cutting edge information on ADAS.

WeberAuto (Classroom Lecture Style)

<https://www.youtube.com/user/WeberAuto>

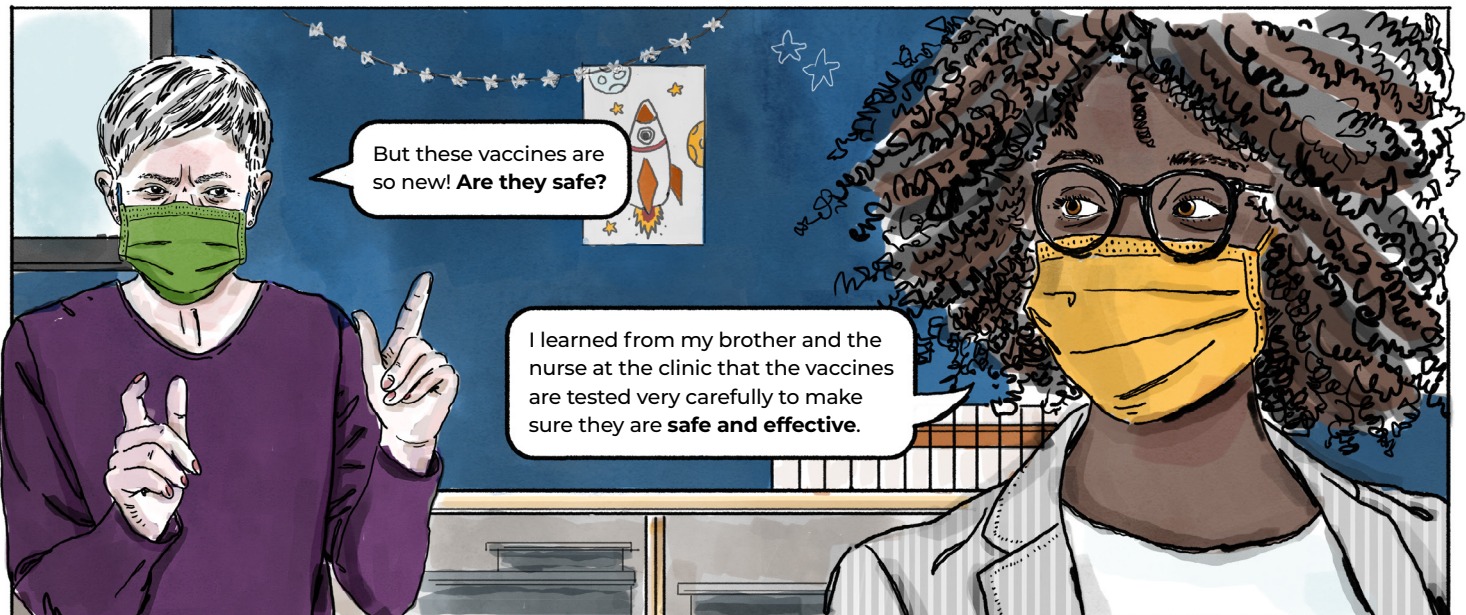
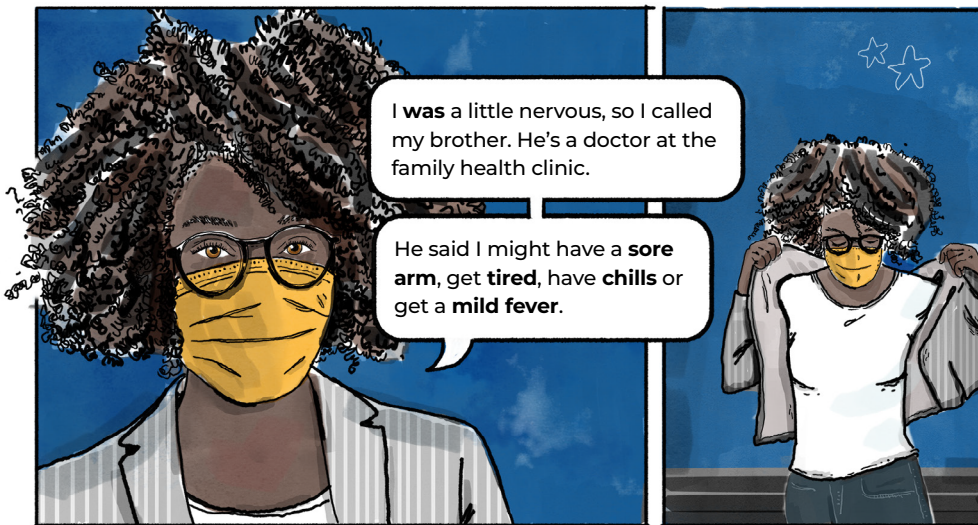
John Kelly is a professor at Weber State University in Ogden, UT. His YouTube videos are long and extensive and he leaves no leaf unturned.

Motor Age (General Training)

<https://www.youtube.com/user/MotorAgeMagazine/featured>

Pete Meir of Motor Age delivers online training on current topics.

A safe and effective COVID-19 vaccine is now available.



They also told me to check out the updates on the **CDC website**—you know, the Centers for Disease Control and Prevention. They're the experts on this stuff.

Here, I'll text you the link. Take a look **for yourself!**

I **do** want to travel and see my family again. And not miss work!

I GOT MY COVID-19 VACCINE!

I was thinking the **same thing!** That's why I got my shot as soon as it was available to me.

Wait—why are you still **wearing a mask** after getting the vaccine?

I get why that could be confusing. My brother said that, for now, it's important to **keep using all the tools we have.**

I had no idea. I guess I need to check out the website to really understand more—and **get my vaccine, too!**

I'm **way past ready** to have our Friday lunches again!

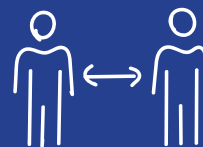
Important Ways to Protect Yourself and Others Against COVID-19:



Get the COVID-19 vaccine when available.



Wear a mask that covers your mouth and nose.



Stay at least 6 feet (about 2 arm lengths) from others who don't live with you.



STOP THE *SPREAD*



WEAR A MASK