NACAT NEWS

VOL. 35 Fall 2021 NO. 3

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The Educational Integration of Digital Technologies preCovid-19: Lessons for Teacher Education

By: Jesús Valverde-Berrocos, María Rosa Fernández-Sánchez, Francisco Ignacio Revuelta Dominguez, and María José Sosa-Díaz

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Abstract

The educational integration of Information and Communication Technologies (ICT) has been put to the test because of the need to implement «emergency remote education» as a result of COVID-19. Within this context of uncertainty («viral modernity»), flexible education is an option to promote a more just, equitable, accessible and creative educational system. In order to properly interpret the effects of this unique educational circumstance, it is essential to study the previous situation in terms of the use of digital technologies in teaching practices. The objective of the study is to describe the educational integration of ICT and the teacher education model to obtain evidence that contributes to understanding the phenomenon. To this end, a questionnaire consisting of two self-reporting tools and a scale on the description of teaching practice with ICT was applied. The sample is made up of teachers from public primary and secondary schools (N = 251). Data collection was carried out in the months prior to the closure of schools due to the Covid-19 pandemic. A univariate analysis of the variables and contrast tests of non-parametric hypotheses was carried out, along with calculation of the reliability and construction validity of the measuring instruments. The results reveal the most frequent types of teaching practice with ICT and the spaces where digital technologies are commonly used. Various weaknesses can be identified in digital competence among teachers, as well as in the initial/continuing training model, which contribute to the understanding of the difficulties encountered during "emergency remote education". Participation in ICT didactic innovation projects and the performance of ICT Coordination are associated with more experiential training. Flexible education requires a redefinition of the teacher training model that encourages learning anywhere, anytime.

Introduction

The current pandemic is forcing education systems to face many challenges that raise very important questions about the future of education. Teachers have been forced to implement, during the closing of schools, an "emergency remote education", very different from planned practices such as distance education, e-learning or b-learning, with very mixed results and the revelation of weaknesses in the system such as the digital divide, inequity or social injustice.

The concept of "Global Pedagogical Blackout" refers to the transition between the Third and Fourth

Continued on Page 8

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CHANGES ARE COMING! NACAT News to SIX issues in 2022!

DEADLINE DATES

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Catching Up with... Dan Perrin

Have you wondered what has happened to NACAT's former Executive Manager, President, Vice-President for Conferences, and all around glutton for punishment, Dan Perrin, since he handed the daily operational reigns of NACAT over to Bill Haas in 2014? Did he disappear down a vehicular rabbithole wondering in his shop, never to return, or make a deal with Elon Musk to try to become the first civilian to restore a classic Chevrolet in space? Did he just sit back and relax by a pool while the days rolled by? Perhaps he's just car crazy and is doing everything he can to fulfill his ambitioins? I thought I would ask him a few questions and give you a way to catch up. I hope you enjoy it.

Dan and Lynda Perrin at their 50th wedding anniversary party.

What have you been doing since leaving the role of NACAT Executive Manager in 2014?

Enjoying life with Lynda our children and grandsons. We have been very blessed to live in a wonderful island community in the house I grew up in. We made many upgrades over the years including a 1200 square foot shop in the back yard. There I maintain and improve Lynda's fleet of classic cars. She knows where to find me, and that I will be doing what I enjoy. Working also keeps me active. Relaxing is not something I do well! The current inventory includes 4 Tri-Fives, a Malibu and El Camino, a C20 Chevy pickup, a GMC Suburban, and a '61 Corvette. Three of them are fully functional and attend local and out of town car shows, swap meets, and auto fairs. We recently added a 2020 Chevy 3500 dually and truck camper. We can now travel knowing who slept in the bed last night. We have an aggressive plan to use it to go to some of the places we have never been. We intend to be at the next NACAT Conference, when it happens.

"The Shop" from its mezzanine.

We have served our church in multiple ways. Lynda has crocheted 500+ hats for "Operation Christmas Child" and supports other projects as well. She makes afghans for persons undergoing treatment for leukemia. Being a survivor herself, she knows that the support you get from outside the hospital is a big boost for healing. I served several terms as a deacon and treasurer at our church. I was also elected to multiple committees. Oddly, I was selected for a 3-year term on our Transportation Committee, which evolved into 6 more years as chairman.

Have you worked on any projects or activities you would like to share with the NACAT members?

Occasionally I fill in for instructors at the technical college, Trident Technical College, from which I retired. We were members of several car clubs and worked the shows and sometimes made presentations about things automotive. Basically, I am not interested in anything that would be long term or limit our ability to go where we want or do what we want at any time we want.

Continued on Page 17

BOARD CHAIR

STEVE GIBSON

RIVERSIDE, CALIFORNIA

Hello again, and welcome to the start of a new school year! I hope you enjoyed a few weeks of rest and relaxation before getting “back to the grind”, whether you were home or away. The NACAT board has been meeting throughout the summer, continuing to shape our organization into a competitive and valuable network to support automotive technology instructors by providing knowledge, experience, training, and teaching tips and tricks in a family type atmosphere now and decades ahead. We have also had a few personnel changes, and I am excited for you as a NACAT member to benefit from what is coming just down the road.

First, I want to congratulate and thank Curt Ward for the leadership he exemplified the past 2 years serving as NACAT President. I’m sure Curt had no idea what was in store for his second term as President, and he did a masterful job guiding NACAT through the COVID 19 pandemic. Even though there were many tough decisions that had to be made, Curt was calm, prepared, and educated to make all the right moves. Despite many small businesses and organizations folding, NACAT is still around thanks to a President who always would “do the right thing”. I will miss you being part of our board meetings.

Next, I want to extend a warm welcome to our new NACAT President Tom Millard. Tom is a high school instructor for Jefferson County Schools in the Denver, CO area. Tom previously served as a NACAT board member and is a familiar face at NACAT and other industry conferences. Taking the reins as our new VP/President-Elect is Drew Barnes, also a high school instructor from Vale, OR. Drew is currently a NACAT board member and will co-serve as VP while he finishes his last year of his board term. High schools have been a minority demographic for NACAT and I’m excited to see where Tom and Drew’s experience leads us.

Board members Tim Isaac and Ricky Martineau did not run for reelection and retired from board service at the end of August. Both Tim and Ricky were on the board when I first joined in 2013, and I thank them for their years of dedicated service.

Last, as you may already know, NACAT Business Manager Bill Haas will be stepping down to attend to the needs of his own business. Bill has been an instrumental part of NACAT and organizing all our conferences from 2016-on. He has been amazing to work with and his business management skills have been a big asset to NACAT. The NACAT board is currently evaluating the business manager position and duties and does not yet have a replacement to announce. You can stay up to date with this change on NACAT social media and in our next NACAT News issue this winter.

So where are we headed? Let me try to explain it with a story.

Continued on Facing Page

CONTINUED FROM PAGE 6

As some of you know, I am a big fan of classic 1960's and 1970's V-drive ski boats. I am currently restoring a 1964 Byers flatbottom, a boat that I have been hunting for almost 30 years. Byers boats are rare, and I've dreamed of owning one for a long time. My love for the boat originates back in the 1990's growing up with a friend whose family purchased one brand new in 1965. When the opportunity came for me to buy one, it was a once-in-a-lifetime moment and I had to pounce.

The boat I purchased had three prior owners: the original owner who owned the boat from 1964 until the late 1980's, the second owner who owned the boat until 2011, and the third owner who I purchased the boat from. The original owner kept the boat in near-new condition, only changing the color of the stripe on the exterior. The second owner ended up painting the boat a new color to make it more personalized to him, then painting the entire boat again in a different color (solid yellow) just a few years later, along with changing the engine. The boat was sold to the third owner who had dreams to restore it, but ultimately it sat in their yard as an untouched project until I purchased it. Sunlight had taken its toll on the paint and some of the fiberglass, some of the wood had rotted away from exposure to moisture and needs to be replaced, but none of those things discouraged me from buying this boat. It was the boat I had always wanted, and I knew how good it would look when restored to a usable condition.

This boat mattered so much to me that I drove 9 hours to go pick it up, then another 9 hours to bring it home. Driving up through the San Joaquin Valley of California, my memory was flooded with memories from the past, growing up as a teenager with my friend and his boat. I couldn't wait to bring my boat home and start making new memories with my boat. My landlord stopped by the day after I brought it home. I saw him eyeing my boat in a very puzzled way. "What do you want that thing for?" he asked, referring to the big hunk of faded-mustard-yellow fiberglass sitting on a rusty trailer in the driveway. His opinion didn't matter to me. I knew he couldn't see my vision or what this boat would look like.

After cleaning everything up after 10 years of sitting outside, I started to strip away the layers of paint that had been applied over the life of the boat. The faded mustard was the first to go, then the white primer underneath it. That revealed a solid blue paint job – that came off too, as well as the white primer it was applied over, to reveal the original white gelcoat the boat wore from the factory. The original stripe was also revealed (under a few more layers of paint). Finally, anyone looking at the boat could catch a glimpse of this boat's original beauty. Here are a few pictures so you can sense the scope of the change.



The purpose of telling this story is to illustrate a point that the NACAT board has decided to focus on this coming year. As loyal NACAT members, we are all familiar with our organization, what we do, the benefits we receive, etc. We find great value in these things and keep coming back year after year. And yes, times do change and we have modernized our organization to reflect our immediate needs in the classroom. But could some of the changes which were made over the years have

Continued on Page 8

covered up some of our original beauty that attracted new members to us? Long time NACAT members know what NACAT delivers – but what about a teacher looking at NACAT for the first time? Would they be attracted to the organization like you were when you first joined?

The board would like to start “peeling away some of the paint” to make our original beauty shine and stand out again. We are truly a unique and rare organization, being run by the same group as those we serve. We are not corporate, we are not affiliated, and no other organization does what we do. Sure, there are other training events out there, but how many of them are organized by fellow automotive teachers? Where else can you find a family of instructors from all walks of life and corners of the continent who share the exact same needs as you? As we begin to uncover our original beauty, I ask of all NACAT members to share with the board what NACAT means to you. Why did you join? What made you come back? If your membership has lapsed, what made you walk away? We are going to uncover many layers, some of them might be ugly, but we know the beauty that is just under the surface.

It is a big project – let’s get to work.

Article: ICT

Continued from Page 3

Industrial Revolution, through which [1] has occurred: (A) a progressive despedagogization of educational reality; (b) the construction of an evaluative culture based on a restrictive concept of quality and relevance; (c) the development of a model of thought based on the "crisis" of the education system; (d) a significant decrease in investment in education, especially in the updating of digital technologies; (e) the application of an outdated curriculum; and (f) the gradual conversion of the teaching profession into a mere curriculum manager.

To try to make sense of the Covid-19 pandemic, one must consider the complex interaction of "viral behaviors" in all spheres of life. Hence the new concept of "viral modernity", an example of "bio-informationalism", which applies to "viral technologies, codes and ecosystems in information systems, publication, education and emerging knowledge" [2]. In this unstable environment, Veletsianos & Houlden [3] maintain the need for a flexible education (teaching and learning anywhere, anytime) that promotes a more just, accessible, autonomous, and creative system. Flexible education, so that it does not become a discriminatory option, must be compatible with socio-constructivist pedagogical approaches such as cooperative learning, learning communities, networked learning or peer learning, supporting students by considering their individual characteristics and the context in which they are developed [4].

The use of digital technologies in classrooms is still far from generating systemic change, rather promoting “islands of innovation”, based on the work of excellent teachers who carry out innovation in their teaching practices using Information and Communication Technologies (ICT) without mediating a formal process of lifelong learning [5]. In fact, some contextual variables such as the school climate or trust within the educational center, the role of the ICT coordinator and the management team, as well as the existence of networks for access to new information and knowledge sharing among teachers, have a greater positive effect on the use of ICTs than traditional lifelong learning activities [6–9].

Continued on Page 16

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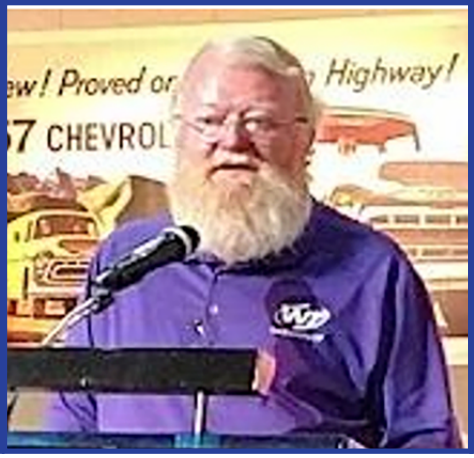

TOM MILLARD

WARREN TECH

Greetings to all NACAT members.

I am hoping this finds you and your family safe and well. These are hard times for our NACAT family and friends. Hopefully you are able to get back to in-shop, and hands-on training. Covid has caused a major change as to what we call " normal". I'm hoping it won't take us too much longer to get back to travelling for training.

I have had the privilege of serving as your Vice-President / President-Elect for the past two years. I have now gained the honor of being your President for the next two years. The Board and I have been discussing the future of NACAT. One of the best activities we offer is our annual training conference. This activity has been on our minds as to how to help getting the members the trainings you deserve. We are still encouraged with the awesome participation of our Virtual Classes (the next one is scheduled on ***October 19, 2021***) as well as the Instructor Roundtables (the next one is scheduled for ***October 21, 2021***). We are always looking at ways to help you get the best training available. We honestly believe that the courses NACAT supplies to instructors from instructors is the best training available.

We are going through some processing and reviews to learn the best ways to serve you, the members, and to be certain we are getting you the best latest and greatest training available. Our commitment to you is to always be available to discuss the best ways to keep you updated and aware of how to improve your educator's toolbox. We are hoping to continue the process of making mentoring and communication a priority. I look forward to hearing from all of my fellow educators on topics that you feel would keep us all involved in the process of changing the life of the curious and eager students we tirelessly work with every day.

Other changes around the bend include a modification to NACAT News. Last year it became an interactive ENews to help save the environment and ensure you received the latest information as efficiently as possible.This year we will expand that effort as we look to get our members publications twice as often. Instead of three editions of forty pages each, we will have six issues of twenty pages each. The schedule for edition release will change from January, March, and October to February, April, June, August, October, and December. This increased level of information sharing and interaction should help us to better serve our membership and friends.

I am hoping we will all be able to meet in person at our next *NACAT conference* scheduled for ***August 8-11, 2022*** in *Covington KY at the Cincinnati Marriott River Center.*

NACAT Remembers

Tom Birch

1938 - 2021

Laurie Dwyer

1961 - 2021

Ivy Tech Community College Indianapolis Opens New $14 Million Automotive Technology Center in the International Marketplace District

Alongside campus leadership, community leaders, automotive partners and more, Ivy Tech Community College Indianapolis officially opened the doors of its new $14 million, 59,000-square-foot Automotive Technology Center in the city's International Marketplace District (4751 Century Plaza Road) on June 9, 2021. This new Center sits on land donated by Sid and Louis Eskenazi and the Eskenazi Family Foundation, replacing the College's former automotive learning facility on East Washington Street near downtown Indianapolis.

"Our new center will bring about new opportunities in technology, partnerships, and experiences that up until now have been quite limited," said Steven Bardonner, dean of the School of Advanced Manufacturing, Engineering, and Applied Science at Ivy Tech Indianapolis. "This will not only positively affect the area where it is located but the Indianapolis service area as a whole, too."

Speakers at the event included Ivy Tech Indianapolis Chancellor Dr. Kathleen Lee, incoming Ivy Tech Indianapolis Chancellor Dr. Lorenzo Esters, Ivy Tech Community College President Dr. Sue Ellspermann, District 94 Representative and Democratic Floor Leader Cherrish Pryor, District 33 and Minority Leader Senator Greg Taylor and Indianapolis Mayor Joe Hogsett.

Ivy Tech's new Automotive Technology Center was made possible through a variety of automotive and community partners, including a $1 million gift from the Indianapolis Auto Trade Association, which provided a jumpstart on the fundraising for this project. It was also made possible through its New Market Tax Credit partners: Cinnaire, PNC Bank and the City of Indianapolis.

Today, Ivy Tech Indianapolis has nearly 300 students enrolled in the Automotive Technology program and hopes to double enrollment with this new Center. Additionally, Ivy Tech's presence in this community will provide an additional resource to the more than 1,100 current Ivy Tech students that live in the International Marketplace neighborhood.

Automotive Technology students will learn the technological skills needed for today's industry in state-of-the-art classrooms and labs, including corporate labs for GM ASEP and Toyota T-TEN. They receive training in a variety of areas of expertise, including electrical systems, engine performance, transmissions, brakes, steering, suspension systems, air conditioning and engine repair.

Aiding in the College's mission to get Hoosiers into high-wage, in-demand jobs, the automotive program offers paid cooperative education opportunities, with a 100% job placement for those who meet industry eligibility requirements. Classes are taught by Automotive Service Excellence (ASE) Master certified instructors using more than 100 training vehicles to help students build career advancement skills and explore manufacturer-specific diagnostic service tools and information.

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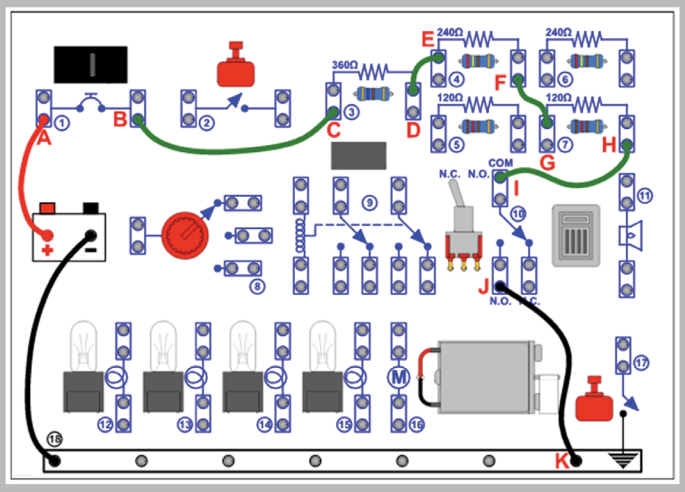
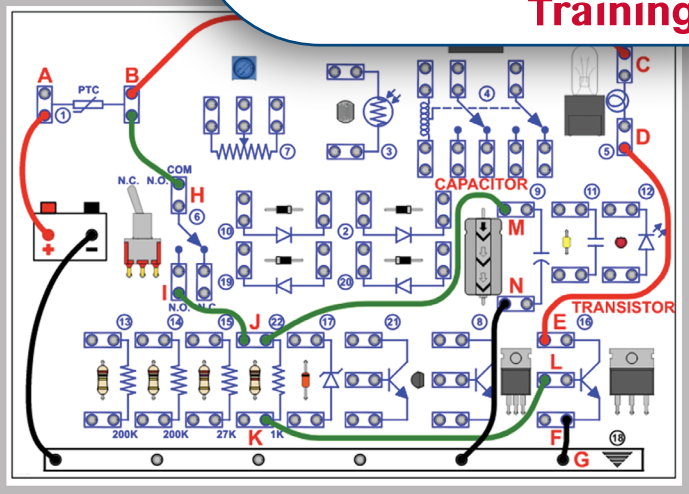




Electricity Program (1810SC)

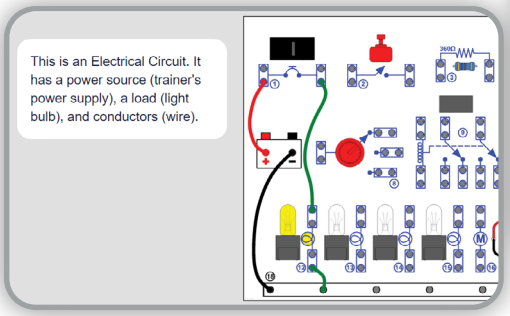
Electricity Program (1810SC) Activity List

Activity 1	Electrical Components
Activity 2	Voltage, Current, Meter, & Series Circuit
Activity 3	Electrical Faults/Troubleshooting
Activity 4	Ohm's Law & Parallel Circuit
Activity 5	Relay and Circuit, Test Light
Activity 6	Horn Circuit, Relay #2, Jumper
Activity 7	Switches, Circuit Breaker, Short Finder
Activity 8	Tail and Brake Light Circuit
Activity 9	Starter Motor Circuit
Activity 10	Turn Signal Circuit
Activity 11	Ignition Key Warning Circuit
Activity 12	Electric Cooling Fan Circuit
Activity 13	Brake Warning Circuit
Activity 14	Heater Blower Circuit
Activity 15	Headlight Circuit
Activity 16	Dome Light Circuit

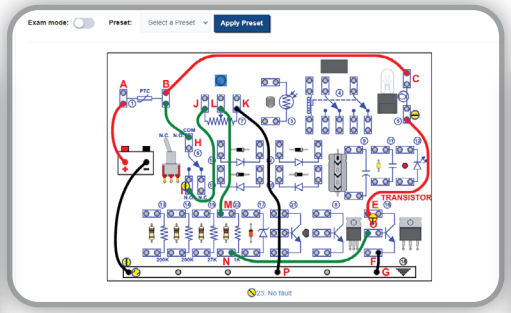
Electronics Program (1820SC)

Electricity Program (1820SC) Activity List

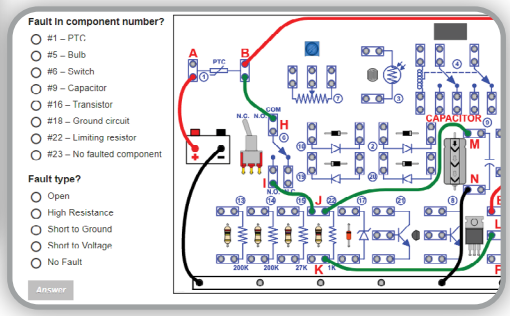
Activity 1	Polarity
Activity 2	Digital Multimeter
Activity 3	Diode Fundamentals
Activity 4	Diode as a Rectifier
Activity 5	Light Emitting Diode (LED)
Activity 6	Clamping Diode
Activity 7	Zener Diode
Activity 8	Transistor Basic
Activity 9	Transistor Circuit
Activity 10	Transistor as Amplifier
Activity 11	Capacitors
Activity 12	Photo Resistor
Activity 13	Combination Electronics



Self-paced activities



Troubleshooting



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JAMES VOTH

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We Need to Hear from YOU!

Most of us have experienced changes in our day-to-day lives over the last 15 months. Some of these changes will probably endure, as there is no need in going back to the way things were. Others, I hope they revert soon.

NACAT too has seen changes. The most obvious change for NACAT has been the lack of an in-person conference in two years, with no conference at all this past summer. This has caused us to lose contact with many of our members. While we still send out the NACAT News electronically to our members, we need the two-way communication in order for us to know how we can help our members. We have endeavored to host a mini-conference over the last year with the same great quality of presenters that you have become accustomed to from NACAT. We also have hosted numerous Round-Table discussions. These discussions have centered on topics of interest to our members and auto instructors in general. More of each of these webinars, and round-table discussion will be coming up quarterly.

NACAT has always be an organization of Instructors for Instructors. We originated as a grass-roots organization for the betterment of our profession. The following was taken from the Articles of Incorporation and spells out our guiding principles.

The purposes for which the Corporation is formed are:

- To encourage and promote the sharing of knowledge by its members;
- To promote enthusiasm for the instruction of automotive students;
- To seek and communicate new methods of teaching;
- To promote effective communication between the Automotive Service Industry and educators in that field;
- To work together for the solution of common educational problems; and,
- To maintain a high level of fellowship among members and with all interested parties.

I believe that this is what NACAT has done for all the years that I have been part of the organization! We started out member run, and over time have taken on a part-time manager. The manager over the years has taken on more responsibility for day-to-day operations, as well as our finances. The manager now does the majority of what was previously the treasurer's role. We have been blessed with managers that have been able to further our goals as an organization, and reduce the workload of already busy Auto-Instructor/Officers and Board.

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While we have been able to trim our budget, there are still cost associated with running the organization. We have always modeled financial responsibility with the funds entrusted to us. We plan to carry on these commitments to our members, but we also need our members to communicate with us. This is your organization and we need you to reach out to us and tell us how we are doing. Help us focus on what you would like to see.

There are changes coming that you will see with our conference and expo next summer. The first change that you will notice, for the next year only, we will be hosting our summer conference and expo in August instead of July. This change was deemed necessary by the cancelation of the last two conferences, and our commitment to hosting in the same geographical area of Northern Kentucky. This may lead to scheduling conflicts with other events for the coming year, but the intention is to switch back to the third week of July thereafter. Another change that you may see coming in future conferences is the format and scheduling of our event. There has been some concern that it lasts too long, so we have been weighing options for change in that regard.

In closing, I want to appeal to all of you. This organization was started by teachers, for teachers. So let's share what we do with other educators that may not know about us, or who have never been members. Membership renewal started September 1. So please send in (electronically) your renewal, and encourage others to join our organization. Membership numbers show a level of commitment from you the members. Join us for our round-table and virtual events throughout the year and ***JOIN US*** in Northern Kentucky next August!

I really want to hear from all of our members and readers of the NACAT News. I can be reached at Jim.Voth@nacat.org. Please fill up my inbox!!!

RELEASE: IVY TECH

CONTINUED FROM PAGE 12

Students can earn an array of credentials, including certificates and technical certificates in as little as two to three semesters, or an associate of applied science degree in as little as five semesters. They are also prepared to take and successfully pass the ASE Technician Certification exam and land secure jobs as technicians, service writers, service managers, dealerships, independent repair shops, part stores, and more.

"Locally in Indianapolis, graduates of the Toyota T-TEN and GM ASEP programs often earn $40,000 to $70,000 per year ($20 – $38 per hour), with the potential to earn more as you advance in your career," said Jeff Evans, Automotive Technology program chair. "They land a variety of jobs such as technicians, service writers and service managers in dealerships, independent repair shops and part stores."

In addition to housing this new program, Ivy Tech Indianapolis admissions representatives plan to have a presence in this new Automotive Technology Center to assist anyone wishing to enroll at Ivy Tech. The College also plans to enhance partnerships within the International Marketplace to increase educational attainment, including partnering with the nearby Global Village to potentially house general/core classes in the future.

For more information about the services and resources available at the new Automotive Technology Center, visit IvyTech.edu/IndyAutomotive.

Article: ICT

Continued from Page 8

Teacher training must go beyond the development of basic digital skills and seek strategies to integrate the interpretative and creative potential of ICT into their training actions. Most teaching practices make "superficial" or "basic" use of digital technologies for pre-class preparation, personal communication, use of word processing, slide presentations or search for information. Teachers feel that they are not sufficiently prepared to use ICT and that the incorporation of new methodological approaches is not sufficiently encouraged. Røkenes & Krumsvik [10] identified, from a literature review, a series of approaches to teacher training in educational technology and subsequently studied their effectiveness in a specific training program, with the following typologies [11]:

a. Collaborative approach: Development of digital competence among teachers through knowledge-building technologies, both synchronous and asynchronous, which include online forums, video conferencing systems, use of social networks and web 2.0 tools (online collaborative documents), blogs or specific software for collaborative learning. These activities also enable collaboration to be enriched with the participation of others (students, teachers, trainers, specialists, researchers) from different geographical contexts. These training proposals enable the development of team work competencies.

b. Metacognitive approach: In this form of training the teacher is directed to carry out a reflection on the didactic action by means of an expression and analysis of his thoughts, behaviors and/or consequences of his professional practices in any situation where digital technologies are

Continued on Page 18

What are your plans for the future?

We pretty much live day to day. We have been fortunate to have traveled to many wonderful locations, and met many terrific people through NACAT, ASE, NATEF, and other organizations. We enjoy and appreciate things natural and aren't attracted to things like cruises, movies, or technology. My 75 years have been spent doing many of the things I enjoy. I long since quit being concerned about things that were out of my control. We have said that when our '61 Corvette is finished we are going to put the top down and cruise down Route 66. We have not figured out how to carry all the stuff that usually goes with us when we travel. It has been suggested to ship clothing and other essentials to points ahead.

Shop decorations.

What experience or advice would you give new technicians, educators, and/or NACAT members?

Technicians and educators need to take advantage of every training opportunity available. Take the time to meet and relate to other people sharing your profession. You sometimes learn more out of school than in a classroom. Teachers should get out and introduce yourself to as many employers in your area as you can. Make sure that they understand what your program is and what level of training you can provide. They will be anxious to see the products of your efforts when they know you well. Have patience. Most things in the Education world don't happen as quickly as you would like. (Plan ahead) Don't jump into anything until you get a full understanding of the final objectives. Take pride in the job you do, because it reflects on the person you are.

What was it about NACAT which kept you actively engaged for so many years?

NACAT is an organization of automotive educators working together for the betterment of its members. I found the delegates to be very committed to getting all the training possible during the week. The conference provided many options for a person to select what areas were most needed, instead of the typical "one size fits all" meetings. Having the conference at other schools gave me opportunities to learn new ways, and often better ways, to teach and manage than I used. Mostly it was the commitment and effort that I saw my peers put in to make their conference the best yet. Each one was unique and committed to the overall purpose of equipping the delegates with the opportunities and training that contributed to their success. I never attended any conference that was not worth my time or investment. Each conference gave me pride in my profession, and I was proud to be involved with so many talented, selfless, and committed automotive educators. The family activities made it possible for Lynda to meet other NACAT wives and secure lifetime friendships. (It's all good!)

When did your involvement begin and what roles did you have over the years?

I signed up for my first NACAT conference in 1983. It was in my home state of South Carolina. Buddy Smith, who I knew from other in-state meetings, invited me to attend. I think he was also NACAT President at that time as well as Conference Host. Unfortunately, my department head informed me that it was his responsibility to represent our school. I could go next time. The next time, I was sent to a 3-day training session at Daytona Beach Community College. Lynda and I did manage to get our first taste of NACAT

Continued on Page 31

Continued from Page 16

involved. Training experiences that use this approach implement, for example, online communication tools, case videos, or microteaching to stimulate critical assessment of ICT use in classrooms. The results of the research show the need for teachers who are in training to gain in-depth knowledge of theories, to justify and understand their own practice and professional decisions, related to the integration of digital technologies into the curriculum. Although there is an over assessment of practical ICT activity to develop digital competence, teachers also demand theoretical training to enable them to develop arguments that justify the use of technologies in their teaching practice.

c. Mixed learning approach: Uses a combination of classroom and non-classroom training to develop digital teaching skills through learning experiences with a variety of technological resources with which one can interact and carry out learning activities. The modality itself directly trains teachers in the use of online learning platforms, as well as in the use of digital materials for training purposes. This modality is particularly appropriate for the teacher's development as a reflective professional because, by increasing the channels available for communication, it is possible to establish debates that foster a critical attitude toward the use of ICT in teaching and adopt a position with regard to ethical problems such as cyberbullying and plagiarism.

d. Modelling-based approach: the trainers act as tutors or mentors to promote certain practices or to offer different visions of the teaching-learning process, through the intentional demonstration of specific action guidelines or teaching strategies related to the integration of digital technologies that can have real impact in the classroom. The hypothesis is that when the trainer shares relevant experiences, examples and strategies on the educational use of ICTs through pedagogical reasoning based on clear, explicit and understandable teaching practice, the digital competence of the educator in training is promoted. Research results show that using strategies, such as examples of how to perform a task with ICT while expressing the mental process aloud, or direct demonstration of how to use a digital resource didactically, have positive effects on digital teaching skills. However, some weaknesses are identified, such as: (a) the passive role of the teacher in training before modelling, without possibility for action; (b) that the "model" is not perceived by the teacher in training with the expected level of digital competence; and (c) the adoption by "mimetism" of certain ICT-modelled practices without adopting a critical, reflective and context-sensitive position.

e. Authentic learning approach: Learning activities represent real-world situations pertaining to the educational context close to the teacher in training. This modality involves teachers in the design, elaboration, application and evaluation of real teaching practices with technologies. They may involve the specific creation of teaching materials and are carried out with the guidance of specialized trainers. It is a formative experience that allows the building of bridges between theory and practice, immerses the teacher in training in active and meaningful learning with positive effects on the perception of their self-efficacy with technologies in the classroom. Research has shown that the most useful form of training is that in which leaders use ICT in their own practice and offer opportunities for teachers in training, beyond a "demonstration". Teachers demand significant learning experiences with ICT because they do not consider themselves able to perceive the real possibilities of digital technologies in the teaching-learning process and therefore do not appropriate ICT for their classes. These results underscore the importance of providing real-world practice opportunities for the development of digital teaching skills and their impact on the development of positive attitudes and self-efficacy perceptions. In cases, the following factors are emerging as essential to teacher training for the curricular

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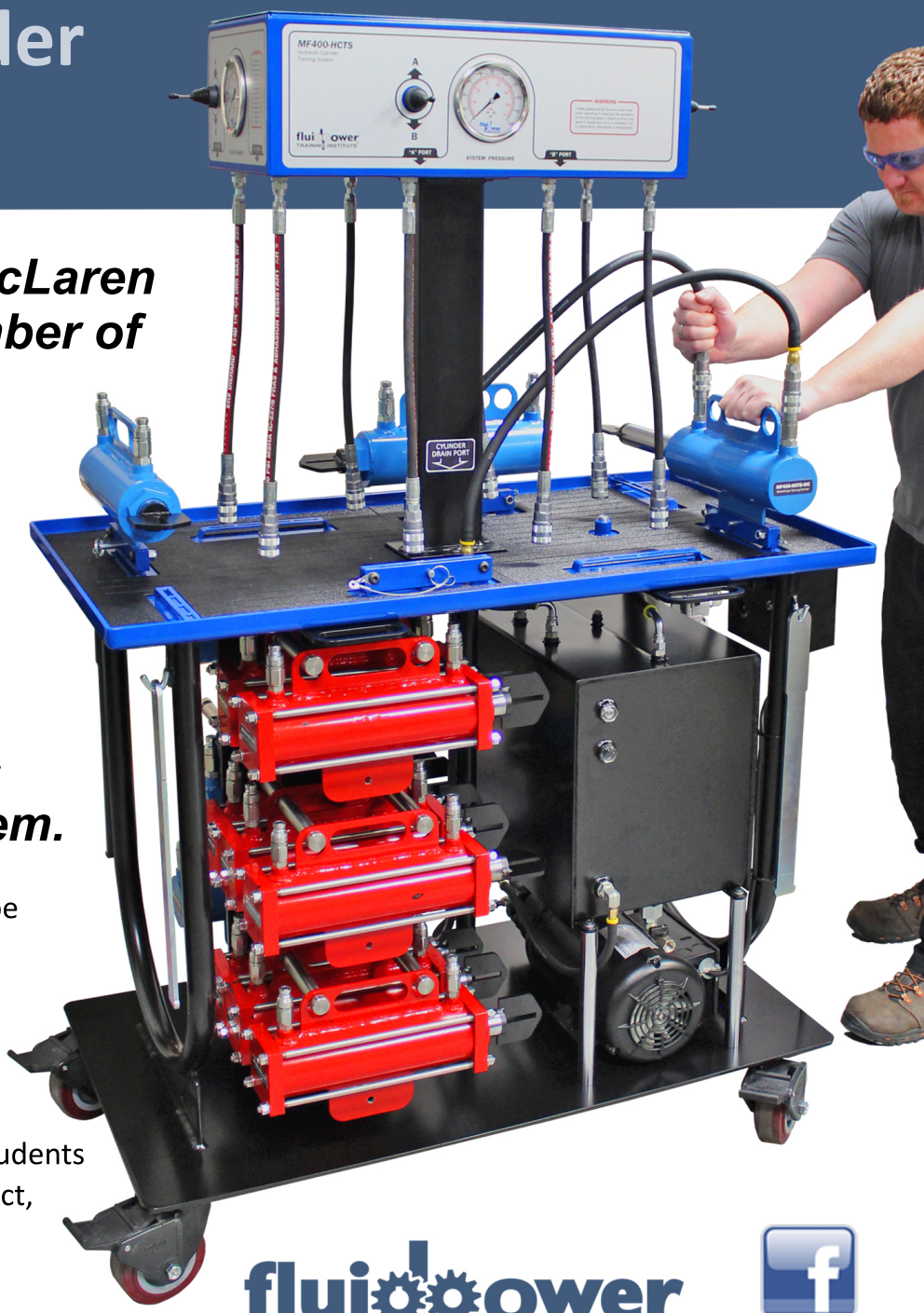
MF400-HCTS

Hydraulic Cylinder Training System



FPTI's founder, Rory McLaren has investigated a number of incidents in which technicians were seriously injured or killed while repairing hydraulic cylinders. This is what inspired him to design the MF400-HCTS Hydraulic Cylinder Training System.

Sooner or later, a technician is going to be tasked with replacing seals in a hydraulic cylinder. A job that seems simple and straightforward can quickly become a technician's worst nightmare.

The MF400-HCTS is designed to teach students how to troubleshoot, disassemble, inspect, reseal, assemble and test hydraulic cylinders - SAFELY.

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Written By Curt Ward

DEMYSTIFYING THE HYBRID-ELECTRIC VEHICLE AUTOMATIC TRANSMISSION

Even to the most seasoned automatic transmission instructor, an automatic transmission from a hybrid-electric vehicle can be a bit of a mystery. Part of the challenge is that very few manufacturers are making internal repairs to these transmissions. Rather instead they are replacing the units. As a hybrid and electric vehicle instructor I wanted to better understand the operation of these units. My goal was to do what we do best. Take something apart and understand how it works.

I was able to obtain a transmission from a wrecked 2008 Toyota Prius (Generation II) at a very reasonable rate from the auto recycler our program works with regularly. See **figure 1**. The transmission had a damaged case near a coolant inlet and could not be used as a drop-in replacement unit. This is a very common unit and great for use in the classroom. If you find a 1st generation or 3rd generation unit, they will work equally as well. I was able to search the Internet and find the Toyota tear-down procedure for this unit. What follows is a summary of what I discovered.

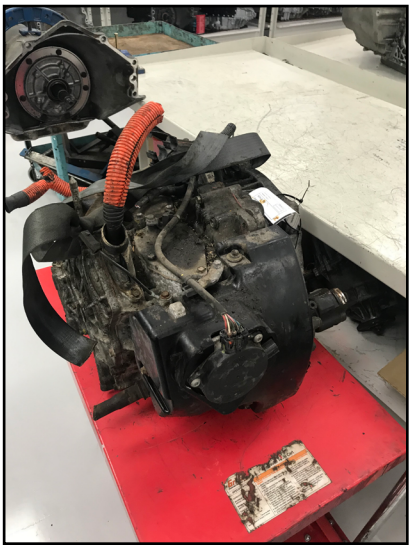

Figure 1

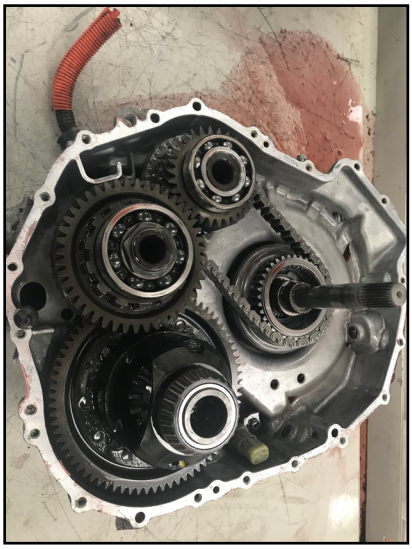

Figure 2

I began by draining the transmission fluid and cleaning the outside case. I then removed all the external components including connectors, coolant hoses, and high voltage cables. Following the Toyota procedures, I separated the two halves of the transmission. The separation revealed two electric motors, a planetary gear set and transfer chain, and a final drive assembly. See **figures 2 and 3**. This is a very simple, yet highly efficient transmission.

Toyota refers to the electrical motors in this transmission as MG1 and MG2. MG stands for motor/generator. MG1 is located closest to the internal combustion engine. See **figure 4** (page 26). MG1 has three main purposes.

- MG1 is used to start the internal combustion engine. When energized, it turns the flywheel and dampener assembly at approximately 1000 RPM to allow the engine to start.
- The engine turns MG1 to generate electricity to recharge the battery.

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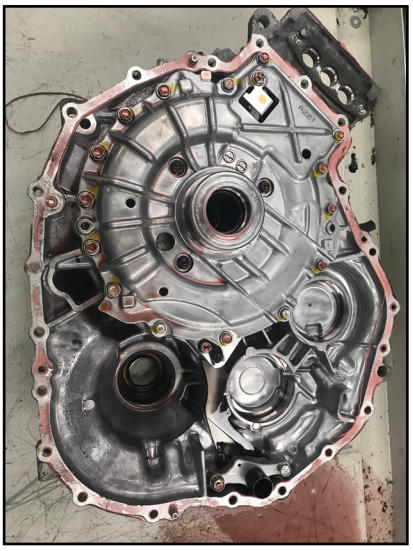

Figure 3

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Continued from Page 18

integration of digital technologies: (1) The commitment to develop a shared vision of the role of ICT in the educational process and (2) the participation of teachers in communities of practice or professional networks. On the other hand, it is considered necessary to bridge the gap between research and educational practice. Thus, the main challenges facing teacher training are [12]: The contextualization of their actions to the socio-cultural, economic, historical and political reality of the specific environment [13]; the development of sustainable and scalable training, through the promotion of communities of practice or online professional networks [14]; didactic innovation with digital technologies in teacher training actions, which model future teaching practices in their classrooms [15]; inclusion in teacher training of ICT decision-making strategies in evidence-based education (products, services or processes), knowledge of context and ethical values [16].

In March 2020, we were closing schools because of the COVID-19 pandemic. At that time, the relationships between students and teachers began to be mediated, in their entirety, by technological tools, and the so-called "emergency remote education" was developed [17, 18]. Educational centers were definitively placed in a virtual space as one of the gears in the educational network, establishing themselves as virtual environments of training and knowledge production. International agencies are looking for ways to guide a clear educational response to the COVID-19 pandemic by urging them to compensate for holes in student access to technology, with special emphasis on students in disadvantaged situations, to increase the training and digital competence among faculty members, in order to articulate systems of platforms and digital resources for the online communication between students and analysis of the digitization process of a Secondary School from the DigCompOrg model teachers, as well as offering a variety of open digital teaching materials for completing school work from home. The OECD [19] is conducting a study that includes 98 countries, whose report reveals some of the priority considerations and responses that education systems have for the so-called "new normal". Identified challenges include: Ensuring continuity of academic learning for students, supporting those lacking independent study skills; ensuring continuity and integrity of learning assessment; ensuring family support so they can guide learning; ensure the well-being of students and faculty. The main barriers they have encountered have been: Availability of technological infrastructure, addressing the emotional well-being of students, addressing the right balance between digital activities and tasks without screens, and managing technology infrastructure. UNESCO has also published its own documents analyzing the impact of the pandemic on school systems, providing recommendations to managers and government administrations for the reopening of schools [20–22]. In the field of educational research, studies have been published in recent months on the pedagogical response to the total or partial closure of educational centers, with approaches to rapid solutions, especially aimed at teachers. This raises doubts within the educational community about the quality of the teaching that has been developed [23, 24]. Spoel et al. [25] found that average prior experience in the educational use of digital technologies influenced a more positive perception of emergency remote education than expected during the school closure due to the pandemic. Neither teachers without experience or those with extensive experience had their initial expectations altered. Fernández & Prendes [26] consider that the digital transformation of schools should be consolidated by evaluating a digital education plan that encourages critical reflection on the role of technologies in learning. Teachers demand better technical support, a higher quality of open educational resources and an update of technological devices. Fernández-Batanero et al. [27] in a systematic review of the literature, found that there are few studies on the development of digital teacher competence and most conclude that teacher training is insufficient, despite being considered a key factor in improving professional performance. Pre-pandemic studies have been lacking in relation to the starting situation, teaching practices and the training of teachers in educational technology that would allow for a

Continued on Page 24

CHILDREN'S MUSEUM OF FOND DU LOC UNVEILS AUTOMOTIVE TECHNOLOGY CENTER

A ribbon cutting ceremony was held Wednesday, July 21, 2021 for an exciting, new exhibit at the Children's Museum of Fond du Lac (Wisconsin).

The Automotive Tech Center is a new immersive STEM space where kids can pretend to be automotive technicians working on a kid-size vehicle. Using diagnostic tools, children can determine the needs of the vehicle. They can then check the parts inventory using a touch-screen to find a part and replace it on the vehicle. There is a creeper to go under the vehicle and check the tires and exhaust system and impact-wrenches to change the wheels. When the work is done, they can return the repair order to the interactive welcome desk. Children visiting the new ATC will receive a free pair of safety googles, thanks to Holiday Automotive.

This exhibit provides fresh activities for the Children's Museum of Fond du Lac, which was closed to visitors for much of 2020. "2020 was a difficult year for the museum and the families we serve. Our staff and volunteers did a wonderful job, but there's only so much you can do remotely. Holiday Automotive has been a supporter of this museum since the beginning, and we can't thank them enough. This exhibit not only gives us something exciting to show our members and new families as they visit, but I believe it will be a catalyst for future investment and fresh content for the Children's Museum of Fond du Lac," stated Andrea Welsch, Executive Director.

Michael Shannon Jr., President of Holiday Automotive, stated, "Our technicians use high-tech computer diagnostics alongside their specialty tools and this exhibit provides a fun glimpse into that world of automotive technology and repair. Having children engaged in this exhibit could inspire the next generation of tradespeople to see the career path as a very real and rewarding option for them."

The Automotive Tech Center, or "ATC" for short, is backed by a 20-foot by 12-foot photographic mural that features a photo of the inside of an actual Holiday Automotive service shop, complete with one of Holiday's technicians at work and a 2022 Chevrolet Bolt Electric Vehicle that hints at the future of automotive technology. The Children's Museum and Holiday have been working collaboratively behind-the-scenes for over a year to create this very special space. Shannon continued, "this community is very fortunate to have the Children's Museum. Andrea, the directors, staff, volunteers and generous community members have created a wonderful resource that provides educational, fun and inspirational activities for the youth of Fond du Lac, and we are honored to play a part in taking it to the next level."

Additional information about the Children's Museum of Fond du Loc can be found at https://www.cmfdl.org.

Continued from Page 22

pedagogically adequate response. From this point of view, we wondered whether the teachers were prepared to move from classroom to online teaching. We analysed what common teaching practices with digital technologies were teachers applying just before the school closed. We questioned the approach used in initial/ongoing teacher training prior to the pandemic. We wondered about the relationships existing between initial/ongoing teacher training and participation in IT teacher innovation projects and the performance of ICT Coordination positions. With these research questions in mind, the objectives (O) of our study are:

O1. Describe common teaching practices with digital technologies and digital teaching competence for the educational integration of ICTs before the pandemic.
O2. Determine the approach used in initial/permanent teacher training prior to the closure of schools due to the pandemic.
O3. To analyze the relationships that exist between characteristics of ICT teaching received by staff and the following variables: (A) participation in ICT didactic innovation projects and (b) performance of the post of ICT Coordinator.

Materials and Methods

Design

It is a survey-type investigation in which the processing of information is descriptive and comparative in nature. This study is part of a research project whose aim is to design an Integrated Digital Education Plan (PIED) in primary and secondary schools for the improvement of learning outcomes, oriented under the principles of autonomy, contextualization, efficiency-effectiveness and didactic innovation. A central focus of this research is the redefinition of the teacher training model, which requires an investigation into teachers' perception of their digital competence, identification and categorization of classroom ICT educational practices and knowledge of whether the perspective used in prior training (initial or permanent) is compatible with the most innovative approaches.

The research process has been divided into four distinct phases (S1 Fig): (A) Problem approach, in which the reference bibliography has been consulted mainly; (b) Research design in which the research instruments were selected; c) Field work in which the online questionnaires were applied; and finally d) The analysis of data, taking into account that the application of the questionnaires was immediately prior to the confinement by COVID-19 and the development of "remote emergency education" and involved a redefinition of the initial problem and the final conclusions.

Participant

The sample was selected from the set of public primary and secondary education centers in Extremadura (Spain), which have a Digital Education Plan (Instruction 20/2018 of the General Secretariat of Education of the Ministry of Education and Employment of the Board of Extremadura, Spain). It is composed of a total of 251 primary (40.6%) and secondary (59.4%) teachers in public centers. The majority are women (64.1%) and civil servants (69.7%). The average age of teachers is 45 years (DT = 8.73). Three subgroups, with a similar percentage representation, are identified with respect to years of professional experience: 10 years or less (33.9%), 11 to 20 years (35.5%) and over 20 years (30.3%). The total percentage of teachers in the sample who occupy (or have occupied) the position of ICT coordinator in their educational center is 14.3%. More than half of the sample faculty (53.4%) have participated in one or more ICT-related educational innovation projects.

Continued on Page 27

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Continued From Page 20

- A combination of engine speed and MG1 motor speed control the planetary gearset to provide additional torque to MG2 to help move the vehicle.

The vehicle only moves when MG2 is turning. See **figure 5**. When energized, it takes 4.11 turns of MG2 to turn the final drive assembly one turn. On deceleration, the drive wheels will turn MG2, and it becomes a generator. During this period the magnetic field of the motor will be controlled to slow the vehicle and generate electricity for the battery.

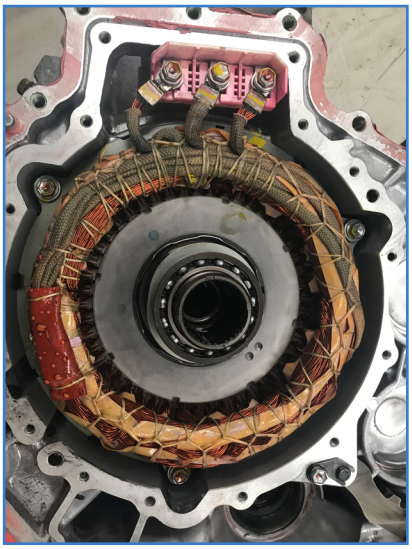


Figure 4

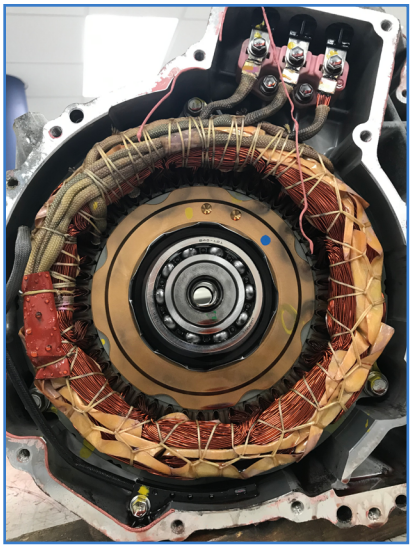


Figure 5

The transmission has two resolvers: one for MG1 and a second for MG2. See **figure 6**. The purpose of each resolver is to provide the ECU with motor position, speed, and direction of rotation. On this model they are not serviced separately from the transmission unit.

Figure 6

The transmission is equipped with two transmission fluid temperature sensors. One temperature sensor is located in the windings of MG2 and the second is located in the fluid sump. See **figure 7**. Both sensors appear to be a negative coefficient type of thermistor.

The transmission fluid is used to cool the electric motors and lubricate the moving part. The transmission oil pump is mounted in the rear of the case. See **figure 8** (page 32). The positive displacement type of pump is driven by a shaft that only turns when the internal combustion engine is running. The unit relies on splash lubrication when operating in EV mode.

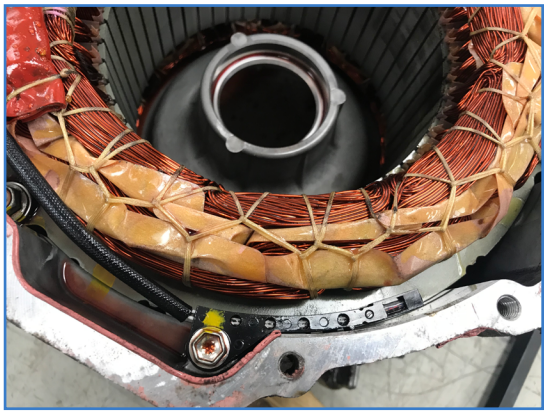


Figure 7

A milliohm meter will be required to test the windings of both MG1 and MG2. See **figure 9** (page 32). The normal resistance of the motor windings is less than 1 ohm of resistance, and a conventional multimeter is not accurate in that range. The difference in resistance between the leads on both of our windings was less than 1 milliohm.

Concluded on Page 42

Continued from Page 24

Instruments

An online questionnaire with three components was applied [28]: Two self-report scales (SQD-Scale and TICTIP Scale) that were translated into Spanish, and an additional series of 22 items based on the Learning Design Support Environment project [29]. The questionnaire was designed to promote the use of digital technologies in the teaching-learning process. These items were organized around three dimensions: (a) spaces used for teaching-learning with ICT (8 items), (b) learning outcomes expected from the use of ICTs (8 items), and (c) type of teaching practice performed with ICT (6 items). The latter dimension is based on the learning typologies of the "Conversational Framework" [30]. A Likert-type scale of six elements was used: (1) Never, (2) Almost Never, (3) Sometimes, (4) Often, (5) Very often, and (6) Always. Lastly, a number of items of teacher data were included. SQD-Scale (Synthesis of Qualitative Evidence) is a self-reporting tool based on a theoretical model called SQD-Model [31], which measures teachers' perceptions of the degree to which they experience the support and training needed to integrate digital technologies into their teaching practice. It consists of 24 items, grouped into six dimensions [32]. Cronbach's Alpha ($\alpha = .95$) and McDonald's Omega ($\omega = .95$) were used as estimates for the reliability of the entire SQD scale. The latter is considered to be more robust and suitable for measuring instruments that are generally applied in the Social Sciences [33]. SQD uses a six-element Likert scale: (1) Strongly disagree, (2) Disagree, (3) Slightly disagree, (4) Slightly agree, (5) Agree, and (6) Fully agree. Each of the 6 SQD dimensions showed the following reliability:

Use of teacher trainers for modelling ($\alpha = .88$; $\omega = .88$), Reflection on attitudes toward the role of technology in education ($\alpha = .85$; $\omega = .85$), Instructional design with technologies ($\alpha = .88$; $\omega = .86$), Collaboration with other teachers ($\alpha = .82$; $\omega = .82$), Scaffolding on authentic experiences ($\alpha = .80$; $\omega = .81$), and Changing from traditional assessment to continuous feedback ($\alpha = .86$; $\omega = .87$). These values are similar to those reported by the authors of the scale [20]. An exploratory factorial analysis (AFE) was carried out to verify the validity of the Spanish version of the construction, and it was verified that it was added to the SQD model of six components. The «Scale for teachers' ICT integration proficiency (ICTTIP)» is a self-reporting tool that measures teacher skills related to the educational use of digital technologies [34]. It is structured in six subscales: Information collection and preparation (2 items), Materials production and problem solving (5 items), Communication and sharing (2 items), Planning, teaching and evaluation (10 items), Teacher training and self-learning (3 items) and Ethics, Health and Safety (5 items). A Likert scale of six elements is used: (1) Never, (2) Almost Never, (3) Sometimes, (4) Often, (5) Very often, and (6) Always. The ICTTIP has shown a high reliability coefficient ($\alpha = .95$; $\omega = .95$). The calculation of the responsibilities for each of the subscales of the questionnaire shows the following coefficients: Preparation ($\alpha = .84$; $\omega = .85$), Production ($\alpha = .82$; $\omega = .82$), Communication ($\alpha = .70$; 2 items), Teaching ($\alpha = .92$; $\omega = .92$), Training ($\alpha = .82$; $\omega = .82$), Ethics, Health and Safety ($\alpha = .80$; $\omega = .81$). Exploratory factor analysis (AFE) for the construct validity of the Spanish version is compatible with the six-component structure of the ICTTIP.

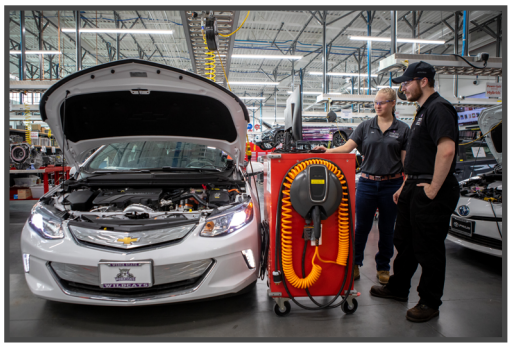
Data Analysis

Descriptive statistics (measures of central tendency and variability) have been calculated for exploratory analysis of the data. These analyses are completed by the calculation of Kolmogorov-Smirnov normality tests for each of the research hypotheses that are compared. For the confirmatory analysis of the data, a univariate analysis of each variable (relative and absolute frequencies, central trend statistics and dispersion) and non-parametric hypothesis contrast tests (Mann-Whitney U) have been used. Rosenthal r was used to measure the size of the effect. For the measuring instruments: their reliability (Cronbach's Alpha and McDonald's Omega) and construct validity (Exploratory Factor Analysis) have

Continued on Page 29

WEBER STATE ANNOUNCES INITIATIVE TO EDUCATE WORKFORCE FOR ELECTRIC VEHICLES

The production of Electric Vehicles (EVs) is expected to increase rapidly in the next 10 years. Thanks to a grant from the Governor's Office of Economic Opportunity (Go Utah), Weber State University's Department of Automotive Technology is launching an initiative to help students from high schools, tech schools and college get ready to work in the changing industry. Initiative partners also include Bridgerland Technical College, Davis Technical College, Ogden-Weber Technical College, Salt Lake Community College and the Davis, Weber and Ogden school districts.



Students in Weber State University's Department of Automotive Technology work on hybrid and electric vehicles in the Computer and Automotive Engineering Building on the WSU Davis Campus.

The launch of the Automotive Strategic Workforce Initiative occured on Sept. 17 at 1 p.m. in the Computer & Automotive Engineering Building at WSU Davis (2750 N. University Park Blvd., Layton). Event speakers included Scott Hadzik, WSU automotive technology chair; Utah Rep. Suzanne Harrison; Sen. Chris Wilson; and Tammie Bostick, Utah Clean Cities executive director.

Weber State's automotive technology department, housed in the College of Engineering Applied Science & Technology, is leading the partnership in an effort to ensure that students from high school to college get the training they need to work safely on EVs. Weber State faculty, who have been trained by manufacturers, will oversee the education.

"More manufacturers are talking about commitments to produce only electric vehicles in the near future," Hadzik said. "We're putting together a partnership with the state and industry in order to make sure technicians are ready to safely work on these vehicles. Safety measures need to be taken, and there is very little training that currently exists."

CONTINUED ON PAGE 33

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Continued from Page 27

been calculated. The questionnaire data was collected between 30 January and 3 March 2020 [35]. The data analyses were conducted using SPSS 25 and JASP 0.14.1.

Ethics

This study was approved by the Ethics Committee of the University of Extremadura (Spain). We conducted this study in accordance with the Ethical guidelines for educational research [36] from the British Educational Research Association (BERA). All participants agreed to participate voluntarily, with informed consent when they fill the survey. and were able to withdraw from the study freely at any time. All questionnaires were designed and applied to ensure anonymity of participants. The data was confidential and participation was anonymous without any potential risk to the integrity of the subjects.

Results

Description of results on common ICT teaching practice and digital teaching competence

In response to the first research objective, several items of the instrument based on the Learning Design Support Environment project and the "Scale of Teaching Competence for ICT Integration" (TICTIP) are analyzed. First, the educational contexts in which technologies are used are analysed including the typology of teaching practices and the expected learning outcomes with the use of ICT.

Educational features used with ICT

The teachers in the sample mostly use the classroom as the educational space for integrating digital technologies, with the highest average frequency of use (**Table 1**). In second place, is the family physical context (home) which is most often used for the educational use of ICTs. Within the spaces of the educational center, the next most commonly used spaces are the IT classrooms or computer classrooms, followed by the library. In both cases the average frequency of use is low. In other areas of schools such as laboratory classrooms or those specific to physical education activities, the use of digital technologies is very rare. It is observed that there is moderate use of the virtual classroom, understood as the use of Learning Management Systems (LMS) platforms (e.g. Moodle), classroom management (ClassDojo) or other resources of web 2.0 (e.g. blogs). The b-learning modality is rare, as reflected by the results of the use of the «inverted classroom» or «flipped-classroom».

Typologies of teaching practices

Teachers use digital technologies more frequently as a resource to support expositional teaching practices (read/view/listen). Secondly, the most frequent activities of ICT use are those involving research, that is, conducting research or exploration tasks. Thirdly, teaching practices that guide the student's tasks toward the application of knowledge are put in place. Teaching methodologies enriched with less common technologies are: (a) collaborative activities involving the development of cooperative learning; (b) learning tasks aimed at the creation or production of digital resources by students (e.g. texts, images, audiovisual, etc.); and (c) ICT-supported communication activities involving debate and reflection. Globally, it is observed that teachers use all the practices identified in the questionnaire with a similar frequency, which is at a medium-high level, according to their perception.

Expected learning outcomes

The most frequent learning outcomes that teachers achieve with the use of ICTs are first to be seen with regards to «understanding», that is student achievement involving competencies for

Continued on Page 30

Continued from Page 29

Spaces used for ICT teaching-learning	M	DT
Generic classroom	5.04	1.139
Technology classroom (IT room or Computer room)	2.71	1.675
Laboratory classroom	1.78	1.331
Physical Education classroom	1.38	.958
Library	2.57	1.546
Student's personal space (e.g. the home)	3.49	1.381
Flipped Classroom (classroom + student's personal space)	2.33	1.509
Virtual classroom (e.g. ClassDojo. Moodle. Blogs. . . .)	3.03	1.760
Learning results hoped to achieve with the use of ICT	**M**	**DT**
Knowledge (define, identify, remember, list. . .)	4.32	1.187
Understanding (classify, explain, ask, select. . .)	4.51	1.154
Application (demonstrate, find, predict, build. . .)	4.49	1.118
Analysis (differentiate, relate, compare. . .)	4.45	1.160
Synthesis (generalize, combine, conclude, explain reasons for. . .)	4.30	1.215
Evaluation (criticize, give arguments for and against, judge, reflect. . .)	4.19	1.279
Attitudinal (show awareness towards, be receptive to, value. . .)	4.33	1.267
Psychomotor (do, perform, draw, develop a physical exercise. . .)	3.25	1.486
Type of teaching practice done with ICT	**M**	**DT**
Read/View/Listen (Exhibit)	4.78	1.105
Collaborate (cooperative)	4.37	1.256
Debate-Reflect (communicative)	4.13	1.333
Investigate (indagative)	4.75	1.181
Practice (application)	4.65	1.182
Produce (creative)	4.30	1.360

Table 1.
Results of Behavioral Data.
Description of the usual teaching practices with ICT: Spaces, learning results and typology.

https://doi.org/10.1371/journal.pone.0256283.t001

classification, explanation, or question formulation. Upon close assessment, «application» is established, i.e. the achievement of learning outcomes linked to demonstration, prediction or elaboration. Thirdly, «analysis» or ability to differentiate, relate and compare is identified as an achievement made through ICT. At the same time, three less frequent learning outcomes obtained through digital technologies are pinpointed: (a) «synthesis», or ability to generalise, combine or conclude; (b) «evaluation», which involves the ability to critique, to argue or make judgments; and (c) achievements in the «psychomotor» field, which have to do with results in physical or manual activities. In intermediate positions, there is an indication of learning results related to the development of attitudes (awareness, receptivity) and the acquisition of knowledge, i.e. to be able to define, identify, remember or list.

With regards to the digital teaching competence for the integration of digital technologies, the "Scale of Teaching Competence for the Integration of ICT" (TICTIP) is analyzed, offering the results by dimensions.

Descriptive results from the «Scale on Teaching Competence for ICT integration» (ICTTIP)

Dimension 1: Preparation

Teachers demonstrate the very frequent use of the Internet to search for information that is subsequently provided to students as a complementary educational resource (**Table 2**). They also use the computer for the development of classroom resources, for gathering teaching materials and for the evaluation of activities at very high frequency. They also spend time, on a daily basis, on the selection of ICT resources suitable for the development of the school curriculum.

Dimension 2: Production

The use of ICTs often favors the introduction of new teaching methodologies, as well as the application of objectives, content and evaluation criteria related to the development of the digital competence established by the curriculum. The use of presentation software for exhibitive classes is quite common. There is a capacity to solve technical problems during class development in most

Continued on Page 32

Continued from page 17

at the 85 Conference at Tarrant County College in Fort Worth Texas. We were hooked and committed to attending every year.

By 1989, it was our turn to host NACAT in Charleston, South Carolina. Our program and Trident Technical College had only two full time Instructors, so I enlisted the help of fellow South Carolina NACAT members Chuck Ginther and Jeff Hunt. There was **one big issue** that nearly cancelled the conference. The only hotel adequate to support a conference with the size and variety of elements of NACAT was closed by the Fire Marshal in late May, with the conference scheduled for July. The City of Charleston and my college administration managed to arrange adequate lodging and meeting facilities, but scattered about the city. We ended up with our casual social event at the beach and our banquet on the aircraft carrier USS Yorktown (CV-10). It worked out to be a very special and memorable conference. We were invited to host a conference again in 1999, and it went off without any issues.

Family photograph taken after Dan and Lynda's 50th wedding anniversary party. Back Row (L-R) James Curry (son-in-law), Robin Curry (daughter), Dan Perrin, Jr. (son), Katy Perrin (daughter-in-law). Front Row (L-R) Alec Curry (grandson), Brendan Curry (grandson), Lynda Perrin, and Dan Perrin. Charleston Harbor forms the background through the window.

A South Carolina school was again a NACAT conference host in 2014. This time it was Greenville Technical College, and NACAT Member Randy McClain was the Conference Vice-President. The conference was a huge success, as are all NACAT conferences, and it served as the perfect backdrop for the transition away from being the NACAT manager.

I was elected to the NACAT Board for multiple terms and served as (unofficial) conference contact for several conferences.

When our long time Executive Manager, Al Goodyear, retired, I applied for the position and was selected as his replacement in 2005. The position title confused some sponsors and organizations. It was more of an office manager job with little decision-making capability. The title got revised and a very experienced and dedicated individual, Bill Haas, took the duties on when I retired from the position.

I feel honored to have had the opportunities to enhance my skill as an EDUCATOR and a member of NACAT, and to share time with some of the most devoted and talented automotive teachers there are.

My wife Lynda was as much a part of NACAT as I was. She planned and managed the family activities for the 2 conferences we hosted, served in the volunteer position as NACAT Historian, and helped me as Manager. We have always worked as a team. GOD gave me the perfect mate to help me with everything I have done since we met. This year we celebrated our 50th wedding anniversary on August 22.

We hope to see you all at the next NACAT Conference!! Stay safe, stay healthy, keep learning, and keep teaching.

Continued from Page 30

Regular teaching practice with ICT	M	DT
1. I use the computer to develop classroom resources, teaching materials and evaluation activities.	5.06	1.045
2. I use the Internet or other information technology, to search for information that I provide to students as a complementary educational resource.	5.31	.809
3. I spend time selecting ICT media or resources that suit the curriculum.	4.90	1.084
4. I use presentation software for my exhibition classes.	4.13	1.353
5. I am able to solve technical problems during class (e.g. when the projector/digital whiteboard does not recognize the computer).	4.01	1.301
6. I apply the objectives, content and evaluation criteria related to the development of digital competence set out in the curriculum.	4.29	1.169
7. I use my computer to record or edit sounds/music as teaching material.	3.88	1.538
8. I use ICTs to introduce new teaching methodologies.	4.43	1.254
9. I use email, instant messaging (e.g. Scratch) or the web to communicate with my students.	4.31	1.689
10. I use blog/web to share knowledge or answer questions posed by students.	3.25	1.783
11. I teach students how to find useful web resources for academic learning.	4.29	1.249
12. In classes where I use ICT, I divide students into groups.	3.56	1.338
13. I make sure that all students have enough ICT resources and skills to perform their academic tasks.	4.25	1.252
14. I provide worksheets to students when I ask them to use web information to complete their homework.	3.58	1.474
15. I use ICTs to foster students' high-level thinking capacity, such as creativity, analysis, and judgment.	4.05	1.287
16. I evaluate students' digital competence as a complement to academic qualification based on written tests (exams).	3.34	1.473
17. I value and rate student learning progress when participating in ICT-supported group activities.	3.75	1.399
18. I evaluate my teaching practices with ICT to improve my classes.	3.75	1.431
19. I design academic tasks with ICT integration so that students without a computer at home can also participate.	3.65	1.604
20. I design different ICT learning activities for students with different levels of performance.	3.57	1.436
21. I spend time learning and practicing ICT skills.	4.30	1.157
22. I use courses and other online materials for my professional training.	4.53	1.187
23. I have attended conferences/conventions or read specialized journals to learn about methods for ICT integration.	3.71	1.439
24. I teach students about ethical rules and norms with regards to the Internet before students use it.	4.23	1.417
25. I demand that students respect intellectual property rights.	4.35	1.446
26. I am aware of problems among teens with Internet addiction and access to adult content pages.	5.41	.878
27. I tell students how abusive use of digital devices can affect their health.	5.15	1.069
28. I follow-up with students who demonstrate low motivation and academic performance due to Internet addiction.	3.41	1.581

Table 2.
Description of the usual teaching practice with ICT: Spaces, learning results and typology (ICTTIP).

https://doi.org/10.1371/journal.pone.0256283.t002

cases. The use of technologies for the creation or editing of sound material for teaching purposes (podcast, music) is rare.

Dimension 3: Communication

Teachers often use email, instant messaging or the web for communication with students, especially through specific communication and educational management platforms provided by the administration (v.gr. Rayuela). However, the use of blogs for knowledge sharing or student tutoring is a little-used resource.

Dimension 4: Teaching (planning, teaching and evaluation)

Faculty often teaches students how to conduct web searches of educational resources useful for their academic progress. Furthermore, in general, teachers find that all their students possess sufficient ICT resources and skills for the performance of their school activities. Teachers often use ICTs to foster high-level thinking skills such as creativity, analysis, and judgment. Evaluation of learning outcomes in group activities, with ICT support, is used in student scoring infrequently. Similarly, it is rare to evaluate ICT teaching itself, with the aim of improving teaching. Every now and then, teachers design academic tasks with ICT so that students who do not own a computer at home can participate. The least frequent teaching activities are: (a) the assessment of students' digital competence and their complementary consideration in relation to learning outcomes on written tests (tests); (b) the division into groups of students in a classroom when using ICT; (c) design of specific learning activities for students with different levels of performance; and (d) providing students with job cards/guides for managing web information in performing school duties.

Dimension 5: Training (professional development and self-learning)

Continued on Page 34

RELEASE: WEBER STATE

CONTINUED FROM PAGE 28

Through the partnership, schools are coordinating stackable degree options, so students can move easily from one institution to another and from one degree to another to advance their education. Increased skills lead to higher wages and validate the need for the strategic workforce investment. Students taking advantage of the stackable credential track will possess the technical skills necessary to be employed with automotive repair facilities throughout the state.

“We’re thrilled to see state dollars support an initiative that’s contributing to the current and future economic stability of Utah while actively sustaining and protecting our environment,” said Dan Hemmert, Go Utah’s executive director. “The launch of the Automotive Strategic Workforce Initiative is a powerful demonstration of community partners joining forces with Utah’s education system to solve both workforce and environmental challenges, providing greater access to education and career opportunities for Utah’s students.”

The initiative will also connect high school students to mentors who can explain the technological advancement of automotive manufacturing and answer questions about industry needs, career options and salaries.

Almost 100 pure-electric EV models are set to debut in the United States by the end of 2024, and President Joe Biden has called for electric vehicles to be half of all new auto sales by 2030. A recent executive order encourages the U.S. auto industry and government to promote legislation and the adoption of electrified vehicles. In order to keep the new EVs safely on the road, industry leaders say it’s imperative for educational institutions to prepare students.

“For the last 30 or more years, we have seen the need for qualified technicians,” wrote Steve Hoellein, Automotive Aftermarket Advisory Council chair, in a letter of support for the initiative. “Over the years vehicles have become more advanced and the shortage of technicians keeps growing. We recognize that the great automotive education institutions are in place here. It's the only pathway to get these great students to enter into this high-demand, high-wage career field."

Continued from Page 32

Faculty often use online courses and materials for ongoing training. In addition, one often spends time learning and practicing competencies related to digital technologies. However, participation in professional meetings (congresses, conferences) or reading articles in scientific journals on the educational integration of ICTs is rare.

Dimension 6: Ethics, health and safety

Teachers often express awareness of the problems of addictive use of the Internet and access to inappropriate content among adolescents. Teachers often communicate to their students regarding health problems that can arise from misuse of digital devices. The demand for students to respect intellectual property rights is quite common. Teachers admit that they often teach ethical standards and rules about the use of the Internet to students in a preventive manner. However, it is unusual for teachers to follow-up with students who show low motivation and academic performance due to excessive reliance on digital devices.

Approach used in preservice/inservice teacher training prior to school closure

In order to respond to the second objective, we analyzed the results by dimensions of the SQD Scale, which inform us of the approach used in the preservice/inservice training of the surveyed teachers.

Dimension 1: Modelling

Teachers say that they know of some examples of using ICTs in educational contexts, but that they cannot classify this knowledge as very extensive in a number of cases (**Table 3**). In the same sense, they claim that they have been able to observe some good ICT educational practices that have inspired them to application in their classrooms, recognizing that their impact on teaching practice is limited. Teachers maintain that they have had some experience in the use of ICT in educational contexts but recognize it as insufficient to be able to integrate these technological resources into professional practice by themselves. Moreover, they consider that concrete demonstrations of the potential for the use of ICTs in education have been limited.

Dimension 2: Reflection

Teachers recognize that they have had some opportunity to reflect on the role of ICT in education. One has occasionally been able to discuss the challenges of integration but one has hardly been given opportunities to discuss the general attitude towards ICT in education or one's own experience with ICT in the classroom.

Dimension 3: Instructional design

Teachers agree somewhat that they have learned how to integrate ICT into their teaching practice in the classroom. However, they feel that they have not received sufficient advice in the design of ICT-enriched learning activities. Nor are they satisfied with the technical and pedagogical support received for the elaboration of didactic materials. In this way, teachers believe that the support received to develop ICT-enriched educational activities and projects has not been sufficient.

Dimension 4: Collaboration

Teachers believe that cooperation with regard to the use of ICTs in education is of some relevance but does not become a prominent variable. They have not observed that teachers routinely assist each other in the use of ICTs in educational contexts. Teachers believe that there have not been enough occasions when they have worked together with other teachers on the use of ICT in

Continued on Page 35

Continued from Page 34

During my initial and/or permanent teaching training. . .	M	DT
1. I have seen many examples of ICT use in educational contexts.	4.27	1.166
2. I have observed sufficient ICT use in educational contexts to be able to integrate these technological resources into my professional practice myself.	3.94	1.187
3. I have seen examples of good ICT educational practices that have inspired me to apply them in my classrooms.	4.12	1.294
4. I have received concrete demonstrations of the potential for ICT use in education.	3.83	1.361
5. I have had the opportunity to reflect on the role of ICT in education.	4.28	1.170
6. I have discussed the challenges of integrating ICTs into education.	3.96	1.213
7. I have been offered the opportunity to discuss my own experience with ICT in the classroom.	3.26	1.371
8. There were specific occasions when the general attitude towards ICT in education was debated.	3.49	1.306
9. I have received sufficient advice in the design of ICT-enriched learning activities.	3.34	1.327
10. I have learned how to integrate ICT into my teaching practice in the classroom.	4.00	1.180
11. I have received technical and pedagogical support for the production of teaching materials.	3.25	1.341
12. I have gained a lot of support to develop ICT-enriched educational activities and projects.	3.16	1.284
13. I have had quite a few occasions when I have worked with other colleagues on the use of ICT in education (e.g. projects of didactic innovation, realization of educational materials, etc.).	3.23	1.297
14. I have become convinced of the importance of cooperation in the use of ICTs in education.	4.47	1.288
15. Teachers helped each other to use ICTs in educational contexts.	3.90	1.311
16. I have shared teaching experiences on the use of ICTs.	3.67	1.397
17. There were quite a few occasions when I was able to consider different ways to use ICT in the classroom.	3.56	1.190
18. I have been able to learn how to use ICT in classrooms through internships with trainers.	3.42	1.329
19. I was motivated to gain experience in the use of ICT in classrooms.	3.69	1.351
20. Teachers themselves were motivated by each other when they tried to use ICT in an educational context.	3.89	1.225
21. I have received sufficient advice on the use of ICTs in my teaching practice.	3.29	1.277
22. My ICT skills have been thoroughly assessed.	2.70	1.174
23. I have obtained sufficient feedback on how to develop my competence in ICT use in the future.	2.97	1.117
24. My competencies in ICT use in the classroom were regularly evaluated.	2.56	1.120

Table 3.
Description of the initial and/or permanent teaching training experience (SQD scale).

https://doi.org/10.1371/journal.pone.0256283.t003

education, such as didactic innovation projects or the realization of educational materials.

Dimension 5: Authentic experiences

Teachers have not observed that they are sufficiently motivated among themselves when they try to use digital technologies in the educational context. Individually, they have not received the necessary stimulus to gain experience in the use of ICT in the classroom. Teachers believe that they have not had enough opportunities to assess different uses of ICT in the classroom and that the results of their training for the use of technologies in the classroom, through practices tutored by advisors, do not reach the desired quality.

Dimension 6: Feedback.

Teachers believe that the advice received on the use of ICT in their teaching practice has been scarce. They argue that they have not obtained enough feedback on how to develop their digital teaching skills in the future. Teachers state that their competencies on the use of ICTs have not been evaluated in depth, nor on a regular basis.

Analysis of the relationships between participation in ICT innovation teaching projects and SQD

First, we respond to the first variable analyzed in relation to the third objective. In this case we analyze the relationships that exist between the characteristics of ICT teaching among staff and the participation in projects of didactic innovation with ICT, obtained from the SQD Scale.

Statistically significant differences in participation/non-participation in ICT innovation projects have been observed in all SQD variables (**Table 4)**. (1) In the "Modelling" dimension with: (a) Observe many examples of ICT use in educational contexts. (b) To get to know the educational uses of ICTs in order to carry out, in an autonomous way, the integration of these resources into teaching practice. (c) Observe good educational practices with ICT that inspire their application in the classroom and (d) Receive specific demonstrations of ICT's educational potential. (2) In the

Continued on Page 37

A PENNY FOR MY THOUGHTS?

EDITORIAL

Do you feel like you have been trapped in a *Gilligan's Island* routine for the last 21 months or so with the Corona virus pandemic. Your close friends have become Gilligan, Jonas Grumby, Thurston Howell III, Eunice "Lovey" Howell, Ginger Grant, Roy Hinkley, and Mary Ann Summers? Things go crazy, and you adapt by finding new ways of doing things you had done differently for years. You start to get comfortable, and then things evolve again. There's always hope around the corner, but it seems we can't yet get free. That day is coming, and you'll once again be together for an in-person conference and social time on the patio.

Now that I got the pandemic out of the way (if only it was that easy), I thought I might take a look back since I have now officially unofficially been involved with NACAT in various capacities for 15 years. During that time there have been highs and lows, new life and death, and lots of change. I won't get super-detailed in any analysis, as this is not the place for that, but I will perhaps provide a bit of a different perspective from the teachers who comprise the membership and heart of the organization.

I was essentially drafted into NACAT in 2006. NACAT had a functioning website being run by a great guy by the name of Al Millman. He was looking to step out of the role and it found its way to me after my wife had initially agreed to do it when she was asked. She was going to be fine doing it as basic HTML in the old Microsoft Frontpage, but moving beyond that into everything involved in Content Management Systems was more than she wished to take on as extra work. I "volunteered" to step into that void. The rest, as they say, is history. At various times since 2006 I have been the webmaster, Foundation director, NACAT News editor, marketing director, and more. I've given many ideas where credit went elsewhere, and I am okay with that, because it helped move things along. I was never in it for the "glory". I was in it because the organization was founded at a small community college, Vincennes University, which was located about 15 minutes from where I grew up. NACAT served as an extra way to connect "home" with family and friends both old and new.

I mentioned that there have been highs and lows during the last fifteen years. I guess it is only right to go through a few of them. Let's start with the highs. There have been many great conferences in excellent locations. I've only gone to a few: Charlotte NC (2009), Sanford FL (2010), Winnipeg (2011), Tyler TX (2012), and Greenville SC (2014). However, I have been regaled by the tales from so many others. I know just how much people have missed not being able to get together the past two years. LOTS of good food and fellowship coexists with the training at each conference. As a family,we learned how to make valve cover racers, made friends, and watched other families evolve. There were also great chances to work with other organizations presented. 2010 and 2012 saw NACAT work with ASE and AYES to bring vast numbers of educators together at the conference. Foundation work aligned yet more companies who shared the desire to assist transportation technology educators.

The lows during the fifteen years are somewhat cavernous so I won't spend much time spelunking. I'll not mention any personal aspects or dealings with individuals who may have complicated the relationship, as they were tangent and there was always a rebound due to the positives always eventually outweighing the negatives, but I will mention the loss that comes when you have to delete a friend from being a contact after their death. There have been too many NACAT friends pass in the last fifteen years. I say that, yet I

Continued on Page 44

Continued from Page 35

"reflection" dimension with: (a) Thinking about the role of digital technologies in education. (b) Discuss the challenges of ICT curriculum integration. (c) Discuss the personal experience of using ICT in the classroom and (d) Discuss attitudes toward the use of digital technologies in educational contexts. (3) In the "Instructional Design" dimension with: (a) To receive advice for the design of ICT learning activities. (b) Learn how to integrate ICT into teaching practice. (c) To receive technical and pedagogical support for the realization of didactic resources and (d) Obtain support to develop ICT-enriched educational activities and projects. (4) In the "collaboration" dimension with: (a) Working in teams on the educational use of ICTs. (b) To assess the relevance of cooperation to the use of digital technologies. (c) Have collaborative experiences among colleagues to integrate ICTs and (d) Share experiences with other teachers. (5) In the "authentic experiences" dimension with: (a) To evaluate different uses of ICT in the classroom. (b) Learning to use ICT through practices with specialized trainers. (c) Be motivated to acquire teaching experiences with ICT and (d) Experience mutual motivation toward ICT among teachers. Finally, (6) In the "Feedback" dimension with: (a) To receive guidance for the use of ICTs in teaching practice. (b) Have a rigorous evaluation of the digital teaching competence itself. (c) Have information on how to continue developing digital skills among teachers and finally, (d) Have a frequent assessment of digital competence among teachers.

Dimension	Item SQD	U Mann-Whitney	Z	p	r
Modelled	1	9568	3.117	.002	.20
	2	9766.5	3.462	.001	.22
	3	10198	4.22	.001	.27
	4	10520	4.779	.001	.30
Reflection	5	9897.5	3.714	.001	.23
	6	9486.5	2.963	.003	.19
	7	9805.5	3.502	.001	.22
	8	9515.5	2.992	.003	.19
Instructional Design	9	10576	4.883	.001	.31
	10	10336	4.492	.001	.28
	11	10856	5.383	.001	.34
	12	10594	4.925	.001	.31
Collaboration	13	10409	4.595	.001	.29
	14	9893	3.689	.001	.23
	15	9433.5	2.847	.004	.18
	16	10029.5	3.898	.001	.25
Authentic Experiences	17	10302.5	4.426	.001	.28
	18	10267	4.33	.001	.27
	19	9401.5	2.784	.001	.18
	20	9640	3.238	.001	.20
Feedback	21	10509	4.773	.001	.30
	22	9072.5	2.217	.027	.14
	23	9071.5	2.224	.026	.14
	24	8938	1.984	.047	.13

Table 4.
Results of the hypothesis contrast of the variable 'Participation in ICT teaching innovation projects' with the dimensions of the SQD.
https://doi.org/10.1371/journal.pone.0256283.t004

Analysis of the relationships between ICT Coordination and the SQD

Finally, we respond to the second variable of the third objective, analyzing the relationships that exist between the characteristics of ICT teaching among staff and the performance of the position of ICT Coordinator in educational centers.

There are statistically significant differences in performance/non-performance in the role of ICT

Continued on Page 38

Continued from Page 37

coordinator with 9 of the 15 variables of the six dimensions of the SQD (**Table 5**). (1) In the "Modelling" dimension with: (a) Observing many examples of ICT use in educational contexts. (b) Knowledge of ICT use in educational contexts to integrate, in an autonomous way, technological resources into professional practice. (c) Observe many examples of good ICT educational practices that inspire application in the classroom and (d) Receive specific demonstrations on the potential of ICT use in education. (2) In the "Instructional Design" dimension with: (a) To have received sufficient advice in the design of ICT-enriched activities and (b) have learned how to integrate ICT into the classroom teaching practice itself. (3) In the "authentic experiences" dimension with: (a) To have had many occasions to assess different ways of using ICTs in the classroom and (b) Have learned how to use ICT in the classroom through practices with trainers. (4) In the "Feedback" dimension with: (a) Get enough feedback on how to develop digital competition in the future. There were no significant differences with any of the variables of the "reflection" and "collaboration" dimensions of SQD.

Dimension	Item SQD	U Mann-Whitney	Z	p	r
Modelled	1	4.745	2.245	.025	.14
	2	4.960.5	2.787	.005	.18
	3	4.711.5	2.143	.032	.14
	4	4.768.5	2.355	.019	.15
Reflection	5	4.413	1.394	.163	.09
	6	4.531	1.692	.091	.11
	7	4.164.5	0.746	.455	.05
	8	4.087	0.551	.581	.03
Instructional Design	9	4.677.5	2.05	.040	.13
	10	4.845	2.496	.013	.16
	11	4.274.5	1.027	.304	.06
	12	4.390	1.323	.186	.08
Collaboration	13	4.466	1.516	.129	.10
	14	4.555	1.751	.080	.11
	15	3.680.5	-0.482	.630	.03
	16	4.356.5	1.232	.218	.08
Authentic Experiences	17	4.681	2.074	.038	.13
	18	4.734	2.193	.028	.14
	19	446.5	1.462	.144	.09
	20	3.978	0.276	.782	.02
Feedback	21	4.516	1.643	.100	.10
	22	4.547.5	1.733	.083	.11
	23	4.951.5	2.778	.005	.18
	24	4.548.5	1.743	.081	.11

Table 5.
Results of the hypothesis contrast of the variables 'ICT coordination' with the dimensions of the SQD.
https://doi.org/10.1371/journal.pone.0256283.t005

Discussions

The objectives of this study were, in the first place, to identify characteristics of teaching practices with digital technologies and digital teaching competence for the educational integration of ICTs, according to the perception of primary and secondary education teachers, through self-assessment tools that were applied just before the pandemic. A second objective was to know the methodological perspective present in the initial and ongoing training of teachers before the closing of schools due to the pandemic. Finally, we aimed to analyze the relationships between this training approach and participation in ICT-based educational innovation projects, on the one hand and the performance of the ICT Coordinator, on the other.

Continued on Page 40

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(MF500-HTTS shown with optional front-end MF500-IS Implement System)

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Continued from Page 38

The theoretical and practical implications of this study derived from Objective 1 (O1) are as follows: (O1.1) The classroom was the most common educational space for the integration of digital technologies. (O1.2) There was moderate use of the virtual classroom, understood as the use of LMS platform (e.g. Moodle), classroom management (e.g. ClassDojo) or other web 2.0 resources (e.g. blogs). (O1.3) The b-learning modality was rare, as reflected by the results of the use of the "inverted classroom" or "flipped-classroom". (O1.4) Digital technologies were used more frequently by teachers as a resource to support expositional teaching practices (read/see/listen). (O1.5) Teaching methodologies enriched with less frequent technologies were: (i) collaborative activities; (ii) learning tasks aimed at the creation or production of digital resources by students; and (iii) ICT-supported communication activities. (O1.6) The most frequent learning outcomes that teachers achieved with the use of ICTs were related to "understanding", i.e., student achievement involving competencies for classification, explanation, or question formulation. "Synthesis" and "evaluation" are the least common learning outcomes. With regard to objective 2 (O2), the most relevant results were as follows: (O2.1) The teachers considered that they had not had sufficient opportunities to work, together with other colleagues, on the use of ICT in education, such as projects for didactic innovation or the realization of educational materials. (O2.2) The model of initial or permanent teacher training reveals a number of characteristics that could contribute to the understanding of the phenomenon experienced during "emergency remote education":(i) Although modeling has been revealed as an effective practice in teacher training [37], there is a lack of knowledge of real-world cases on ICT integration, insufficient teaching experience with ICT and little use of demonstration and observation of teaching practices enriched with digital technologies. (ii) Training has offered few opportunities for reflection on attitudes toward ICTs or communication of teaching experience itself, as well as on the role of technologies in education and its challenges. (iii) Technical and pedagogical advice for the use, design and development of technology-based practices and resources is considered insufficient.

Whatsmore, with regard to objective 3 (O3), the most outstanding results were: (O3.1) The existence of statistically significant differences in participation-non-participation in ICT innovation projects in all variables of the SQD. A relevant conclusion of this study is the relationship between the participation of teachers in ICT didactic innovation projects and the development of lifelong learning with greater opportunities for modeling, reflection, counselling, collaboration and knowledge of educational experiences. (O3.2) (O3.2) The existence of statistically significant differences in performance-non-performance of the ICT coordinator role with 9 variables belonging to the SQD's "Modeling", "Instructional Design", "Authentic Experiences" and "Feedback" dimensions. It is concluded that the ICT coordinators show more favorable conditions toward a model of lifelong learning based on observation and demonstration, with greater external support and training to integrate technologies into teaching practice, supported by a direct knowledge of ICT use modalities in the classroom and with sufficient feedback to adequately develop their digital competence.

Recent advances in research on the SQD model support the results and proposals of this study in relation to teacher training [38]. In particular, the search for an integrated approach to the development of digital teaching skills concludes with the identification of three relevant strategies: (1) the use of the demonstration, through examples, by the models to be followed (to show quality practices); (2) the facilitation of the realization of ICT-enriched classroom educational practices (to gain experience); And (3) advice and support for the design of ICT educational activities (to stimulate and guide digital education plans). These three strategies are considered to be a "roadmap" of an inclusive model of competence development for the curriculum integration of digital technologies by teachers.

How it has been shown according to evidence, the educational integration of ICT's reveals a

Continued on Page 41

Continued from Page 40

number of weaknesses that have had an impact on the development of "emergency remote education": the lack of evaluation of the digital competence of the students, the lack of experience in the elaboration of teaching materials to support and which are appropriate to the individual differences or the limited use of online didactic communication. Both initial and ongoing teacher training does not achieve optimal results in relation to the development of this competency [39, 40]. In line with our results, various studies in the Spanish context conclude that teachers do not yet have sufficient level of digital competence [41, 42].

On the other hand, the model of initial or permanent teacher training (SQD) reveals a number of characteristics that could contribute to the understanding of the phenomenon experienced during «emergency remote education». Firstly, it is evident, although modelling has been revealed as an effective practice in teacher training [43], that there is a lack of knowledge of real cases on ICT integration, insufficient teaching experience with ICT and little use of demonstration and observation of teaching practices enriched with digital technologies. Secondly, training has offered few opportunities for reflection on attitudes toward ICTs or communication on teaching experience in itself, as well as on the role of technologies in education and its challenges. Training should address both beliefs and behaviors, be integrated into the teaching of subjects and placed environments of teachers and connect theory with practice and teachers should be trained through communities of practice and vocational learning [44–46]. Thirdly, it is evident that technical and pedagogical advice for the use, design and development of technology-based practices and resources is insufficient. A recent study found that only a third of teachers considered their school well prepared to use digital media before the closing of classrooms [47]. Fourthly, teachers do not sufficiently appreciate the relevance of cooperation, have had little chance of sharing experiences and mutual assistance is not frequent. It has been shown that collaborative work during teacher training in digital skills allows the acquisition of more knowledge and experience than individual work [48, 49]. Fifthly, teachers perceive a lack of motivation (incentives) toward the educational integration of ICTs and lack of time to assess new practices and receive mentoring on these initiatives. Teachers should have the opportunity to observe, reflect upon and experience how digital technologies can be used in teaching-learning activities [50]. In sixth place, there is evidence of the need to carry out, on a regular basis, an assessment of digital teaching competence that allows the design of training appropriate to the degree of development of knowledge, skills and attitudes of the teachers. The use of the strategies described in the SQD model has been shown to increase the practical levels of the TPACK [51] on the relationships between Curriculum Content (CK), Technology (TK) and Pedagogy (PK) of teachers in training [52]. Teachers need initial and ongoing training that is designed according to a series of principles that have been shown to be effective by educational research [53]: (1) orientation to curricular content; (2) use of active learning strategies; (3) involvement of teachers in collaboration; (4) use of models and/or modelling; (5) facilitation of coaching and expert support; (6) availability of time for feedback and reflection; and (7) sustained medium- and long-term duration. Voithofer & Nelson [54] investigated how teacher trainers implement the TPACK model [55], that is, the complex integration of curricular, pedagogical and technological knowledge into their training programs. The results of this study showed that the adoption of the TPACK was quite limited and consequently, an adequate training model for the integral development of digital teaching competence is not being applied. Since content, context and pedagogy are inseparable components of teacher knowledge [56], the educational integration of digital technologies is inseparable from the varied knowledge and practices applied by teachers. Therefore, training programs must go beyond exposure and reorient themselves toward an integrated experience that includes modeling and multiple opportunities for the use of technologies in specific educational contexts that allow for validation of instructional designs and digital resources. Alemdag et al. [57] designed and implemented a teacher training program based on the TPACK model. The

Continued on Page 43

Continued From Page 26

Figure 8

Instead of completely reassembling the transmission, I decided to create a cut-away demonstrator to use in the classroom. I removed part of the transmission case in the bellhousing area to better show the operation of MG1. I then restacked the components needed to show the power flow through the transmission. See **figure 10**.

The disassembly of this unit only required basic hand tools. No special tools were required. When I removed MG2 from the case, I needed an extra hand to overcome the strength of the permanent magnets in the rotor.

The second-generation Prius transmission is only one of several transmission configurations that are currently in use. It is my hope that my demonstrator will help the students to better understand the internal operating system of this style of transmission. Based on my positive experiences, I hope you will be motivated to find a unit and experience the same discovery learning that I enjoyed.

Figure 9

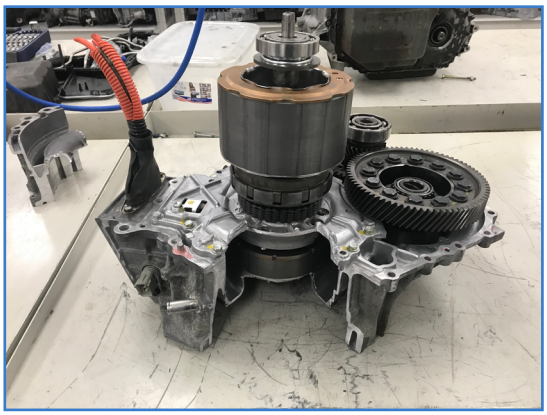

Figure 10

Tell me and I forget.
Teach me and I remember.
Involve me and I learn.

Benjamin Franklin

Continued from Page 41

results showed the need to identify the specific requirements of teachers, foster an active role from the teachers and provide opportunities to collaboratively design and develop digital educational resources. It is evident that there is a clear need to use the TPACK model with the integration of its three knowledge frameworks, as well as a greater contextualization of the use of technologies in the classroom. Collaboration among teachers is another recurring factor in literature.

An important conclusion of our study regards the relationship between the participation of teachers in ICT didactic innovation projects and the development of lifelong learning with greater opportunities for modelling, reflection, counselling, collaboration and knowledge of educational experiences. Positive effects have also been revealed with regards to the digital teaching competence of teachers who develop the role of ICT Coordinator in centres.

The results of this research are consistent with studies that highlight the importance of collaboration in teacher training, through different strategies of social practice. Spiteri et al. [58] conclude in a study on digital teacher competence in primary education teachers, that continuing teacher training should offer opportunities to apply classroom technologies collaboratively, encourage reflection on teaching practice with ICT and promote feedback among peers. Management teams should provide spaces and times for this communication between faculty members. It is concluded that mutual support among teachers facilitates the development of innovation with digital technologies. Rodriguez-Tiana et al. [59] studied teachers' adoption of innovation by analyzing 40,235 shared learning designs across online professional communities within Graasp (https://graasp.eu/), a non-profit digital education platform used by more than 35,000 teachers around the world. The Knowledge Appropriation Model (KAM) [60] was used to identify different social practices and their relationship to the implementation of didactic innovations. This model identifies three categories of practices: (a) Knowledge maturation: Individual teacher creations are shared and transformed to be transferable to other educational contexts; (b) Knowledge scaffolding: Teachers request and receive help from other partners in the face of certain pedagogical problems arising in their professional practice; (c) Knowledge Appropriation: Explains how collectively developed knowledge is subsequently applied individually. The results show how the three practices have a strong relationship with the adoption of innovations concerning technologies in the classroom, concluding the relevance of social practices in the effective integration of technologies into teaching practices. Finally, Ley et al. [61] showed the benefits of an inventive Teacher Innovation Laboratory (TIL) program, based on the replacement of a linear model of knowledge transmission with a social dynamics approach in co-construction, co-creation, reflection, collaboration and knowledge integration between educational researchers and in-service teachers. The results support the importance of carrying out systematic and prolonged co-creation processes among researchers and teachers to facilitate the curricular integration of ICTs, through the adoption of methodologies appropriate to the context of digital education. It was concluded that the adoption of innovative practices by teachers requires teacher training that promotes social practices, where knowledge with sound scientific basis is co-constructed and which formalise educational proposals that are applied in real contexts where results can be evaluated.

With regard to the pedagogical approach to teacher training, there is an evident need for teachers to take a more active role and have opportunities to design and implement ICT educational practices in specific contexts. Martinez [62] identified three beneficial strategies in teacher training for ICT integration: (A) teacher collaboration, (b) digital pedagogy and (c) teacher needs. Collaboration, through open communication and feedback, contributes to meaningful learning and offers the opportunity to evaluate one's teaching practices from the experience of other colleagues. Furthermore, training must lead to the development of didactic skills to critically assess the impact on learning

Continued on Page 45

know I only have a fraction of the connections within the organization that someone like Charter Member Fritz Peacock has. That's a man who can tell you some stories about NACAT and many various other things – he should pitch a show to Discovery Plus!

Are you still there? You are? Great! Do you want a little of that analysis? Okay, I'll share some.

NACAT does many things well. They host excellent, family-friendly conferences when public health allows. They deliver top-of-the-line trainers for the conferences. They make sure members get a one-stop experience for all they need. However, as you read in the Chairman of the Board's update, they need to continue to adapt. They've not been the best at marketing themselves, as name recognition has always been low. Part of this is a pure function of economics as other automotive service organizations have deeper pockets and are more engrained in the industry. NACAT was close to becoming an affiliate within a family of companies about nine years ago, but for various differences remained independent.

Due to limitations in scale and scope, I believe NACAT needs to utilize a good low-cost, high-return strategy to showcase the organization and what it does. I'll present a few things in the following paragraphs.

It is hard for NACAT to have a presence at every industry event which happens or every training conference in the United States or Canada. The logistics just aren't there. The organization relies on the ability of its manager and volunteers to serve as the beacons to others during as many events as they might be able to attend when they have the ability to represent NACAT along with their other duties. The multi-tasking ask is often great. Does the organization have a hit-list of events where they ***MUST*** be present each year? Do they have a manner in which to secure a spot and have a physical presence? It could prove beneficial if costs and availability allowed.

The organization has a presence on FaceBook (732), Twitter (168), LinkedIn (85), Instagram (121), and YouTube (305). Total subscribers/followers on social media add to 1411. Do those platforms provide the reach needed or are they forming an echo chamber where information is predominately being shared with those who are already friends or members? Should NACAT be crafting monthly podcasts to have placed on iTunes and other services? Perhaps. Would NACAT benefit from utilizing more interactive posts and having a presence on TikTok and other platforms? Maybe, but I don't really think the channels are the issue so much as the availability to have high level communication with past members, present members, and potential members might be. Don't get me wrong, the people who communicate and post on behalf of NACAT have worked hard to do all they have done (even more so the past two years to keep things moving forward while others struggled). I don't want to diminish their efforts. There's just more to do.

I can't really say how NACAT has been with communicating personally with members throughout the member cycle (acquisition, enhancement, and retention/loss) since I am not a member. I know there are mass emails and social media posts. There are virtual events being held and the organization is attempting to stay forward. The group works diligently to serve its members because it is what they do and because the economics of member retention are always better than the cost of member reacquisition. Since having to partake in recapture dynamics is unavoidable, I think the membership strategy could benefit from utilizing a type of Geggenpress. The term is made famous by Liverpool Football Club's manager, Jurgen Klopp, who says, "The best moment to win the ball is immediately after your team just lost it." In NACAT's case, this would simply mean that, while they want to retain members and never lose them, perhaps the best time to win them back is immediately after they depart. How does that happen? Perhaps survey them to find out why

CONTINUED ON PAGE 47

Continued from Page 43

in the use of digital tools. Finally, it is noted that training usually offers courses whose design does not include the individual and context characteristics of the teaching staff, decreasing the relevance of these learning experiences and their transfer to classroom practice. Fernandes et al. [63] through a review of the literature, identified three theoretical frameworks in ICT teacher training: (1) focus on the technological object: emphasis on the role of different tools and digital resources in teaching; (2) curriculum renewal: proposals of formative models for the use of digital technologies and pedagogical approaches based on inquiry; (3) cognitive processes: constructivist and conceptual knowledge-oriented approaches. It is evident that teachers do not clearly perceive the benefits of digital education in their professional development. It is also evident that most studies reveal that short-term courses or workshops are inadequate strategies to achieve change in teaching practices.

The online modality has been studied and there are similarities with our results regarding the propriety of adopting a collaborative, contextualized, practice-oriented and modeling approach. Bichler et al. [64] carried out the design, implementation and impact study of an online training course for secondary education teachers who were in transition to emergency remote education during the COVID-19 pandemic. The teacher training model used in this research presents a cycle that involves personalization, collaboration (teachers, researchers and ICT experts) and the viewing of the curriculum through the web. It is oriented toward the implementation of a constructivist pedagogy to customize didactic units on the web based on the results of the students. The results of this study show the value of context-specific online training in providing educational responses to specific student demands. Bragg et al. [65] analyzed, through a systematic literature review, the most effective practices for online teacher training and identified components of program design that improve curriculum and pedagogical knowledge. As a result of the study, it is confirmed that the most relevant elements are the promotion of participation and collaboration; the systematic use of guidance and scaffolding; the use of contextualized learning activities; the application of knowledge and skills acquired in practice; and flexible, objective-oriented design.

This research has some limitations. First, the sample of the study represents teachers from educational centers in a Spanish region who are characterized by having developed an initial digital education plan and who have participated in teacher innovation projects. Consequently, the transfer of results to all teachers should be considered with caution. Secondly, data obtained through self-report questionnaires reflect exclusively the teachers' own perception and for a deeper analysis of the phenomenon, data collection would be required in classrooms and centers based on direct observations of teaching and organizational practices. Thirdly, this research will be placed within a very specific time frame which, unexpectedly for researchers, became a point of scientific interest, due to the consequences that the closure of educational institutions has had on the use of ICT for education.

With regard to future studies, we believe that it is necessary to redefine teacher training for the integration of ICT into more contextualized, reflective and participatory models. Consequently, it is essential to place the digital teaching competence within the framework of the Digital Education Project of the educational center and with this development in mind, we are beginning to apply a training model based on Design Thinking with very promising results.

This training perspective starts from the discovery of educational reality (initial diagnosis and definition of challenges) and continues with the interpretation of the context (identification of teaching practices and feasibility analysis) in a proactive manner by teachers. As a result, proposals for action are defined and priorities are established that are implemented for experimentation and where

Continued on Page 46

Continued from Page 45

appropriate, reformulation, within a cyclical, iterative and continuous improvement process. In this model, the groups are made up of teachers from the same school and the trainers take on a role as dynamizers, guides and facilitators of the process.

The closure of schools has revealed a number of problems [1]. On the one hand, a pedagogical problem derived from the majority use of transmissive teaching, centered on the teacher, that does not fit with the innovative (disruptive) models of online education. On the other hand, it has been shown that teachers have insufficient training to carry out their guiding function with students outside the classroom. Moreover, these difficulties have generated an uncritical defense of face-to-face education, which does not consider its structural limitations for flexible and transformative education. Finally, it has been understood that the "new normal" consisted of a return to the educational status quo but this return does not seem desirable if the pandemic is seen as an opportunity for the transformation of the education system.

In conclusion, the development of digital competence is a fundamental component of the initial and ongoing training of teachers. However, it is a complex process that includes various strategies, for which there is not yet an integrated approach to improve teacher learning about the pedagogical uses of digital technologies. The most effective model for developing teacher digital competence is based on offering experiences that integrate digital technologies into learning as part of their training [66]. It is not enough to provide teachers with access to ICT; time to experiment and technical training on certain digital tools is also required. Reflective knowledge and skills needed to integrate digital technologies into teaching practice should be developed in teacher training programs [39].

Supporting Information

S1 Fig. Phases of the research design.
https://doi.org/10.1371/journal.pone.0256283.s001
(TIF)

S1 File. Survey PIED.
https://doi.org/10.1371/journal.pone.0256283.s002
(PDF)

S2 File. Data survey PIED.
https://doi.org/10.1371/journal.pone.0256283.s003
(XLSX)

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References

References may be viewed by clicking https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0256283#references

they left and actively engage with them to correct the issue, if possible, while letting the individual have a part in the process. Give them some ownership of being able to fix what they saw as a problem. It won't always be possible, but it may often be. An aggressive yet respectful strategy when a member is lost can pay dividends and optimize organizational resource utilization.

What was the point of the micro-analysis?

I wanted to illustrate some of what I see and to request your assistance. I would like to ask you to help the organization by partaking in the following five steps.

1. Please email Jim Voth at Jim.Voth@nacat.org as he requested on page 15 of this issue.
2. Please take the time to follow NACAT on any and all wof the social media channels you utilize.
3. Write one social media post about NACAT in your social media and use the hashtag #NACAT.
4. Be a beacon for NACAT during any industry event or training conference you attend. Wear a NACAT lapel pin, talk about the organization, or otherwise reference it however you can fit it in.
5. Help the NACAT Board while they figure out the next step in NACAT's evolution. Officer and board contacts are located on page 4 of this issue. Your active involvement can make all the difference.

Would you take these five steps? If you'll take them with me, we can help ensure a further mutually advantageous future which gets us off the island and back in full control of our path forward.

NACAT
NORTH AMERICAN COUNCIL
OF AUTOMOTIVE TEACHERS

STOP THE SPREAD

WEAR A MASK