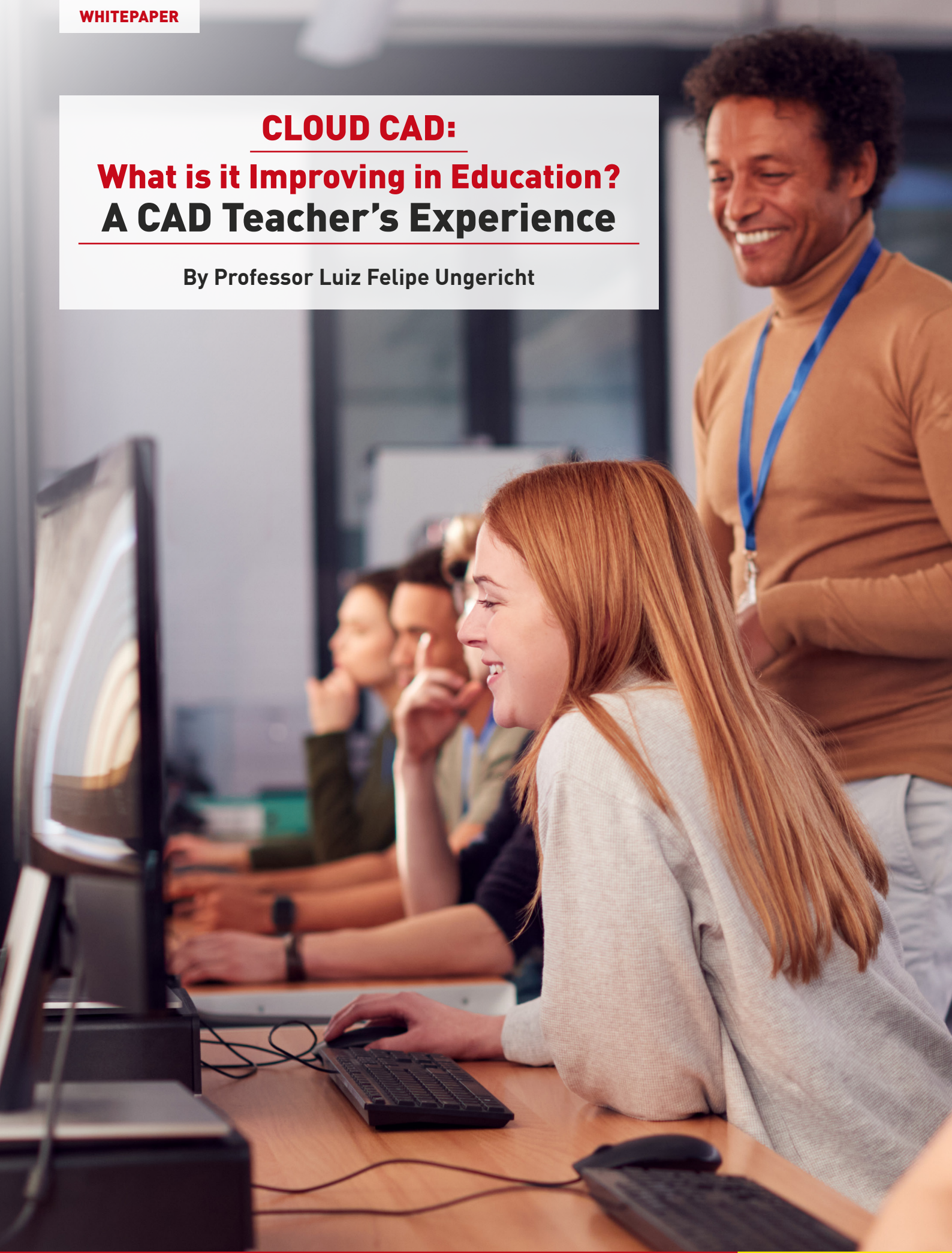


CLOUD CAD: **What is it Improving in Education?** **A CAD Teacher's Experience**

By Professor Luiz Felipe Ungericht



CLOUD CAD: What is it Improving in Education? A CAD Teacher's Experience

Professor Luiz Felipe Ungericht shares his firsthand account of switching from AutoCAD in the computer lab to the ARES Trinity of CAD software everywhere — with results ranging from increased learning speed to significantly better grades.

Get to Know the ARES Trinity

Much more than a suite of three solutions, Graebert's **ARES Trinity of CAD software** combines the strengths of desktop computers, mobile devices, and cloud computing into a unique CAD ecosystem. Because ARES Commander is installed locally, you have the option to work offline as needed. ARES Kudo (which runs in an Internet browser) and ARES Touch (which is designed specifically for smartphones and tablets) add the agility of Cloud and Mobile CAD, unlocking advanced collaboration capabilities.

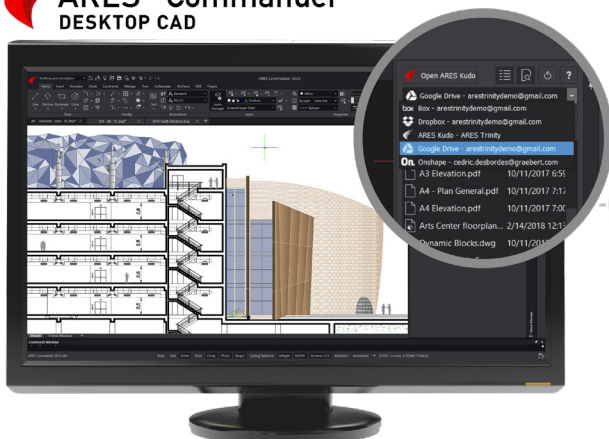
30 hours of CAD lessons with
60 STUDENTS
in 3 groups

CAD program completed
30% FASTER
than with AutoCAD

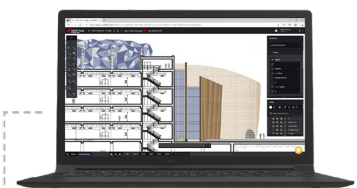
Grades obtained at the exam
15% HIGHER
on average

ARES® Trinity CAD SOFTWARE

ARES® Commander DESKTOP CAD



ARES® Kudo CLOUD CAD



ARES® Touch MOBILE CAD

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Meet the Professor

Luiz Felipe Ungericht is an architect and urban planner with a Master's Degree in Education. Luiz is a tenured professor at Instituto Federal Catarinense, Brazil; former director of the Real Estate Development program there; and coordinator of the school's graphics lab. He also collaborates with Graebert, consulting as a customer success manager. Before joining the university, Luiz had a private practice. He worked for the City of Itajai, Brazil, as a senior architect and urban designer for eight years, serving as the city planning director for two years.



Could ARES Really Replace AutoCAD for My CAD Lessons?

I began working with computer-aided design (CAD) way back in my teens, when I started drafting for my father, a civil engineer. Later, I opened a private practice and worked at a municipality as an architect and senior urban planner. Finally, I became the professor I am today, teaching courses ranging from urban design and architecture to technical drawing and CAD.

Like many of my fellow teachers, I was propelled — or rather, forced — by the COVID-19 pandemic to update my teaching methodology in all the subjects I teach. CAD was undoubtedly the one that needed the most significant change; until then, I had taught CAD in the same way for more than ten years. Of course, the software programs received updates, new tools emerged, etc. But the teaching practice remained the same: It was always students sitting in a computer lab, with AutoCAD installed on the machines, led through practical exercises by a teacher who was there in person.

During the pandemic lockdowns, these computer labs — along with the rest of the campus — became inaccessible. I realized that very few of my students had a laptop or a computer at home with enough capacity to install AutoCAD. We didn't know how long the situation would last, so as a teacher, I had to look for an alternative.

After long research and many tests, I concluded that I should use a cloud-based solution, but the software choices were fewer than with locally installed software. When choosing a new application, my most significant requirements were a complete array of features to fulfill my teaching program, and full compatibility of files and tools with the program that students had been using previously. (Since I had begun the semester in the classroom with AutoCAD, I wasn't willing to lose all that work and start from scratch.) And that's how I found Graebert's ARES Kudo.

When I tested file compatibility, none of my teaching files presented any problems or crashes. Kudo works natively with DWG files, and imports and exports to other formats. So far, so good. Then I explored the tools and features to determine whether I could begin using Kudo immediately, leveraging my experience with AutoCAD. Although the interface was different (after all, it is an application that runs straight from an Internet browser), the icons with the main tools were recognizable. A textual menu was easily accessible, and specifically, the names of almost all commands — and even keyboard shortcuts — were the same.

As for the other necessity, I found that all the features required for my teaching program were there, plus a little more. For my use, “full features” includes, but is not limited to, the creation and modification tools for drawing architectural projects: annotation, dimensions, layers, blocks, hatches, layouts, entity properties, etc.

In my case, it was important to use a browser-based solution to enable my students to work from home. But if you prefer to teach on a program whose interface is very close to AutoCAD, I would recommend focusing on the desktop version, ARES Commander (note that this version also includes the Trinity collaboration features mentioned in later sections).

In the beginning, I was simply searching for an alternative that would enable me to adapt my lab-based teaching methodology to a new reality — and ARES Kudo was the solution. But I soon realized that ARES software could provide much more than a remote teaching method. And, what if I tell you that since I changed the CAD software I use to teach my students, I can finish my teaching program 30% faster, and my students achieved grades 15% higher on average, compared to my pre-pandemic classes! Interesting, right?

As a professor, it is difficult for me to recall any methodological experience that has resulted in such a significant improvement in teaching quality in such a short time. And not only that — my work as a teacher became much more agile and efficient after switching to ARES. Grading assignments for a class of 30 students took me less than half the time that it did before.

My experience demonstrates not only how ARES can replace any CAD program for DWG, but also how it can improve various quality metrics of teaching CAD. To better understand these benefits, I focused on five that directly impacted the teaching–learning process:

- + fostering out-of-class engagement;
- + better assignment correction and grading;
- + increased learning speed;
- + ability to expand course content; and
- + significantly better student performance.

Part 1 | How Technology Can Transform Learning — and Teaching

| Out-of-Class Engagement

More often than not, my students would open their CAD software just once a week, during class hours. There were multiple reasons, such as outdated hardware, frequent crashes, not having a computer powerful enough to run an AutoCAD installation, or not owning a computer at all. The bottom line was that keeping students engaged and working on their assignments outside of class was one of my biggest challenges when teaching CAD. It inevitably slowed our progress through the course, because we always had to recap past classes, and also hindered our ability to build logical connections between various pieces of content.

The great revolution that ARES Trinity brought to my classes was to incorporate the digital technologies of today's world into teaching and learning, effecting dramatic change. Engagement outside the classroom is an excellent example of this transformation, as the points below will illustrate.

| Mobility

The physical boundaries of universities, as well as workplaces, are no longer limitations. We don't need to be at the university to study, and we don't need to be at the office to work. It seems obvious, but understanding the paradigm shift this conveys requires a little more analysis and reflection. I'll focus more on the educational environment, but it's easy to extrapolate to the professional world: *Any activity we do today can continue after we leave the place where it began.*

The truth is that even when we're in a dedicated environment, working on a particular subject, we're not disconnected from the rest of the world. Our smartphones and other connected devices keep us in touch with the countless other issues we deal with throughout the day. So to expect modern students to experience education as they would have in the past is to disconnect them from the world in which we now live. As teachers, we must provide sufficient opportunities for them to explore the educational process in various ways, adding and developing cognitive skills that are indispensable for their present and future.

The ARES Trinity of CAD software brings this mobility and flexibility to CAD teaching, by enabling teachers and students to use any type of device, in any location. The software can be installed on desktop or laptop computers with Windows, Linux, or macOS, and on mobile devices with Android or iOS. It can even run in the cloud and be accessed via an Internet browser, on virtually any computer. This complete OS compatibility opens up opportunities for incredible engagement anywhere, anytime, because the student always has a powerful and complete CAD tool.

The same DWG file open
in ARES Commander
(Windows, macOS, and Linux),
ARES Kudo (which runs in
your Internet browser), and
ARES Touch (Android and iOS).



Synchronization

Increases in mobility can sometimes make it more challenging to save files in an organized way, requiring users to constantly check versions, formats, dates, etc. But ARES Trinity solves this problem efficiently, by synchronizing files in the cloud.

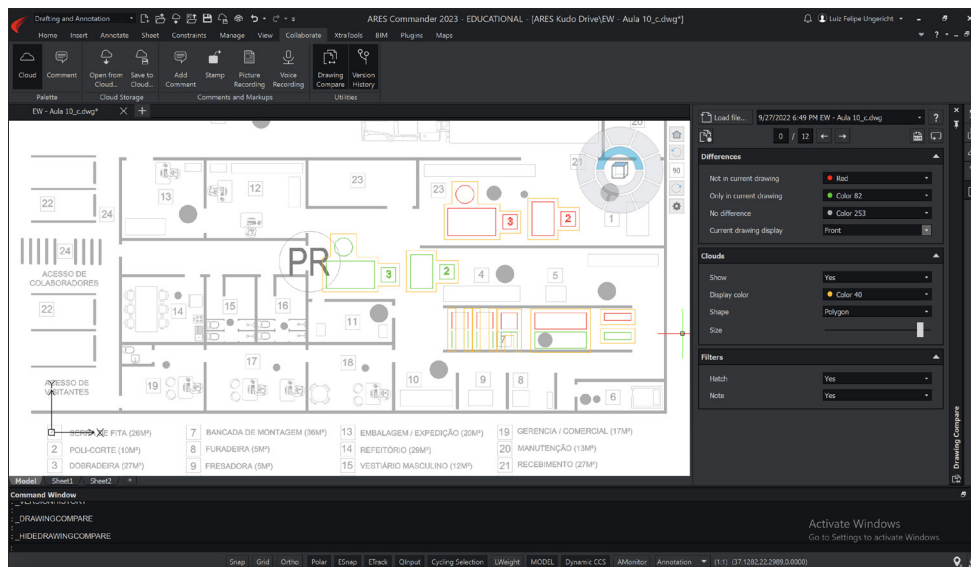
There are different ways to use ARES CAD software, but in the classroom I constantly sync the files at a cloud storage provider. Here, the options are numerous, from the widely used Google Drive, Dropbox, and Box to more advanced options.



For beginning students, I like to use ARES Kudo Drive, a native storage service that provides some free storage space right out of the box, as well as templates and examples of drawings.

When a student is working in ARES Kudo, the file is saved to the cloud automatically. When they open ARES Commander or ARES Touch, the updated file is there, right inside the program. In short, all you need is to connect to your Graebert account, and your files are always available, up to date, and compatible, regardless of which ARES Trinity program was last used. A computer crash, a lost flash drive, or an email that didn't arrive will never again be reasons (or excuses!) to lose drawings or to have an outdated version of a file.

Speaking of versions, the software has a great Version History tool; you no longer have to use Save As and rename a file as V2 or V3. If something goes wrong in the file, or I want to understand a change that has been made, I can ask the student to open previous versions and compare them. When we combine this tool with the collaboration options, we can check a version and quickly learn who made the change. It also enables us to determine when the drawing started to go in the wrong direction, which helps the student to learn from the mistake.



The Version History tool in ARES Commander features color highlights that help students understand what changed in the file compared to an older version (i.e., the same file in the cloud, but before changes were made).

Interactivity

Nothing is more common nowadays than digital interaction. With nearly everything we encounter on our devices, we have the opportunity to comment, like, or ask. This type of communication is expected to be instantaneous (otherwise it can be considered correspondence, not interactivity). So how can we expect that teachers' communication with students occurs only in the classroom, or that it becomes just one more email on a stack of generic emails?

ARES Trinity brings new and different ways to interact with students or a design team, some of which I will explore in greater depth in the next topic. But I wanted to highlight here the possibility of commenting on students' drawings in their files and being able to exchange text messages, audio, or even image markups.

This capability is excellent for me because it keeps hundreds of emails from appearing in my inbox every week. It's also great for students, because they don't have to keep looking for information outside the drawing environment. These tools have revolutionized how I correct assignments and give feedback to students — and that's what I want to talk about next.

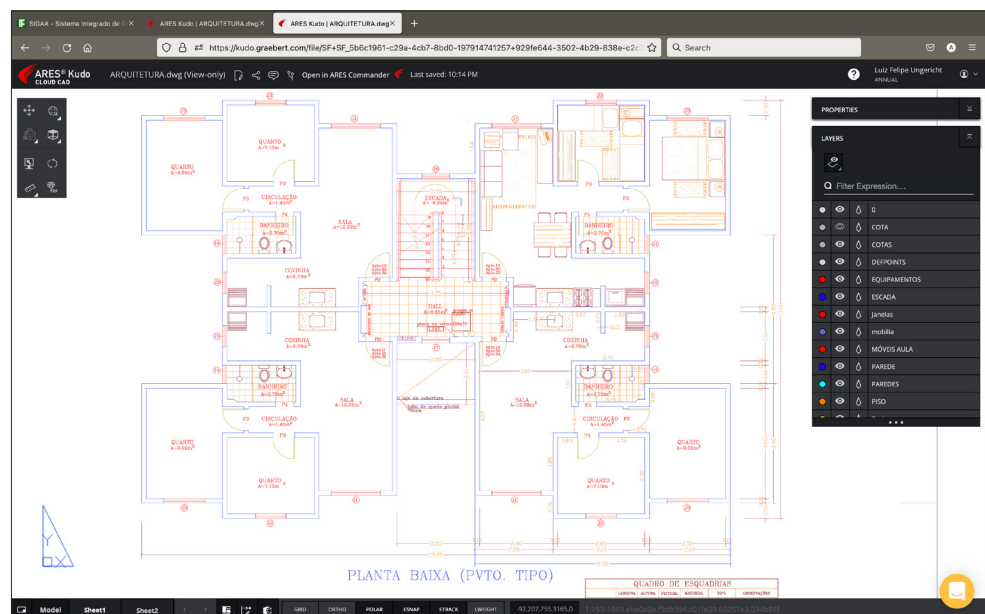
Better Assignment Correction and Grading

Anyone who has taught CAD, or who has worked with a large design team, knows how laborious it is when you request any task or project from the group. You must collect the drawings from every student, one by one. Whether in DWG, PDF, JPG, or some other file format, you will receive them by email, by message, by an academic communication system ... and probably some other method too!

Typically, those who teach CAD like to open each student's DWG — especially in classes for beginners — to check alignments, open points, entity snaps, and layers, for example. This process entails three time-consuming steps: downloading dozens of student files, opening each student's file, and sending feedback somehow. I'm sure the process is still like that in various professional environments. Correction or feedback is usually sent through individual email accounts or some specialized system. If we need to show the student something in the drawing, we have to change the DWG, save, and send it back — adding a fourth step to the process.

With ARES Trinity, this process has become much easier, more agile, and more efficient. The student can activate the sharing option by generating a view-only link at any time during his or her task. Anyone who has this link can view the current state of the drawing. That's because it does not generate a static snapshot, but rather an access window; at any time, I can check the up-to-date drawing. And I no longer need to download dozens of files one by one: Students simply send me their links and I open the files directly in my Internet browser, on any computer I am using, regardless of whether CAD is installed.

Example of a view-only link opened in my Internet browser.



In addition to my educational use, I experienced how the view-only links would make a lot of sense in the professional sphere. Before becoming a teacher, I worked as an architect and urban planner for a town hall in my state. When I was the director, it was common for the mayor to request urban planning projects from our team for discussion and analysis. Our standard process was to generate a PDF of the project or print it, send it to the mayor's office, and wait for his schedule to accommodate a meeting.

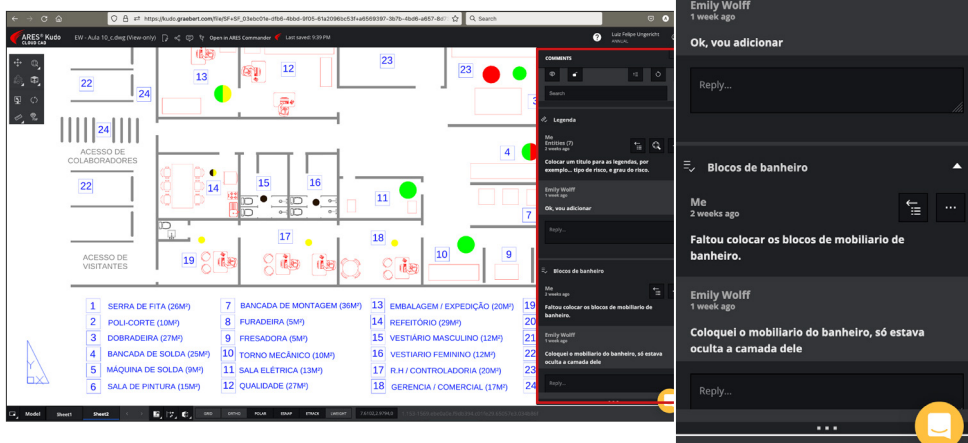
It turns out that a design department is dynamic, and a mayor's schedule is chaotic, with frequent delays. Sometimes I had to ask the mayor to wait for an email to arrive with some update that I knew we'd made downstairs. It was not uncommon that when the mayor finally called for the meeting, he would open the file, but it was no longer the current version. Or worse, he was referring to a printed drawing that had already undergone updates. If we had been able to use the view-only link function of ARES Trinity, we would have saved a lot of time, discussion, and ... paper.

Getting back to education, there is another revolution in the grading process that I incorporated into my classes — a benefit that comes from the need for collaborative design teams. As I mentioned, ARES Trinity provides advanced interactivity capabilities, whether the tool is Commander, Kudo, or Touch. I have found the feedback capabilities, such as stamps and comments, especially useful.

When I get the link to grade the work of a student, I simply click to open the drawing in the browser (by the way, Kudo identifies that I have the option to open it in Commander instead, and with a click, I can do so). I do the analysis and corrections, and I give the feedback to my students right there. I do this in a few ways, including making comments and markups, applying stamps, adding images, and recording audio explanations.

Comments and Markups

I can write a general comment for my student, share guidance or corrections, congratulate, mentor, etc. I can choose specific design entities and make comments related to those entities. A practical example: a beginning student sends me his drawing, stating that he failed to make a hatch. From experience, I know that there was probably an open point in the drawing, leaking the hatch. Since I can access the drawing, I can zoom in at will to identify problems. I select the entities involved and explain with a comment. The student will receive the comment right away, and he can highlight the entities to which this comment refers, making it easy to see exactly where the problem arose. In teamwork, each person's comments are identified. Comments can be marked as resolved or replied to, and new comments made in other areas of the drawing. It is a complete platform for interaction.

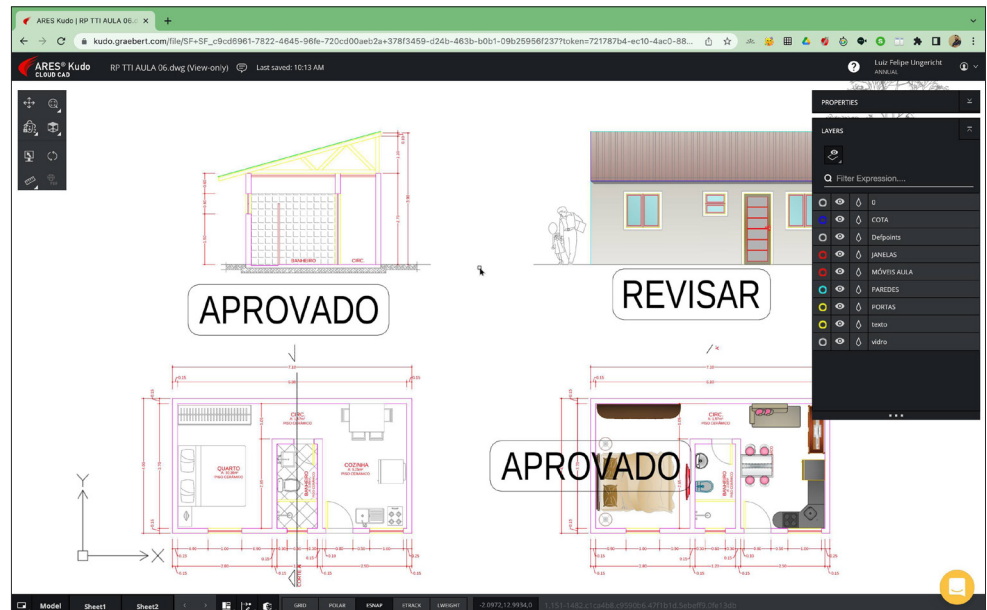


An example of comments I inserted in a view-only link shared by one of my students.

Stamps

This tool is great for quick visual identification of the points to communicate. I can add short messages — such as Fix It, Approved, Swap Layer, Review, etc. — directly to the drawing area. Sample stamps come ready to use, but you can create as many custom stamps as you like. Most importantly, these stamps — just like the other types of markups — are not inside the drawing, but on top of it. Comments and markups do not add any geometry inside the layers; they can be shown or hidden. It helps to keep the drawing clean.

Stamps inserted in the student's drawing help draw attention to the specific tasks to be performed.



Images and Audio Markups

As previously noted, you can add images or audio comments as well as text comments. Audio recording is a fantastic time-saving option. For design teams, it is an ideal option when a professional goes into the field and wants to communicate with the office by mobile phone. He or she simply opens the drawing in ARES Touch and makes the recording, which will be available to any collaborator with access to the file. The same feature is available as well in ARES Commander and ARES Kudo. It is also an excellent tool for giving longer or more detailed feedback in the school environment. For instance, I use it sometimes to explain the use of some specific command. The student can follow the audio, pause, and repeat as needed. And I don't need to type out the instructions step by step!

Image markings are an effective way to elucidate some situations visually. I typically use this feature to send details of other drawings to exemplify something the student is struggling with, such as representing a revolving door. I can send an image of an actual revolving door and a blueprint representation so the student can visually understand. Multiple images or photos from my mobile device (ARES Touch) or my computer (ARES Commander or online with ARES Kudo) can be inserted into the same picture markup. Remember that all this is available in the student's DWG file! No more having to exchange multiple emails, calls, or messages over the phone. No more saving links to sites and sample files in

folders scattered around the computer. And none of this additional information changes the drawing; it's all in a collaboration thread, but with the option to zoom to a selection of entities for context, and easily resolved or hidden. If needed, I can also show previously resolved discussions and reopen one.

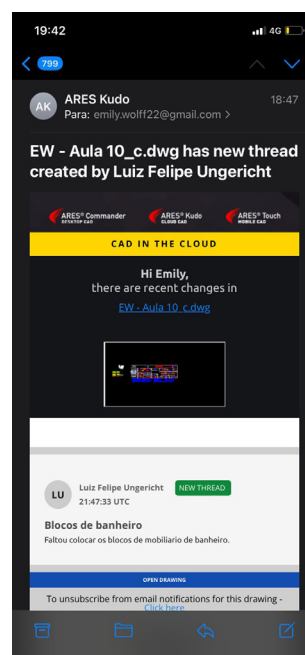


This picture markup is linked to a selection of entities inside the drawing.

Email Notifications

The next feature I want to discuss here is email notifications. Anyone who is the owner, or has been given viewing or editing rights for a DWG file, can receive email notifications when updates are made to the drawing. This means that every time I make a comment on a student's file, he or she will be notified about it. Email notification helps users to follow activity in the file without needing to open the drawing. The students can react promptly when required (for example, when a correction is needed), but they don't need to continually open the drawing to look for activity. The emails also contain the comments, markups, and stamps that I added. Even voice markups can be checked there, since they are converted into text in the emails.

As file owners, students receive the notifications by default, unless they change their email preferences. (They can also adjust preferences to receive a recap email daily, or after each new modification is saved, or less frequently.) I always advise my students to keep email notifications on, since it is nice for them to receive an automatic email as soon as the teacher has reviewed the drawing, with a recap of all the comments and markups.



An example of an email notification received by the student where she can see the comments and markups I inserted. Such notifications encourage the student to open the drawing and make the necessary changes.

Part 2 | Practical Results in Teaching Metrics

At this point, you have already noticed profound changes in our student–teacher interactions. These primarily resulted from the learning environment I created with modern technologies in ARES Trinity, including: cross-platform compatibility, mobile device support, cloud-based software and files, and interactive communication features. And you have also learned how the grading and correction process became much more agile and efficient (not only for the student, but for the teacher as well, I assure you).

Now let's start looking at some concrete evaluation metrics from my experience with ARES Trinity for education. What I will present next, in my experience as a teacher, is superior to any methodological change I have ever tried to make in any course that I teach.

In the first half of 2022, when we returned to holding classes entirely in person, we reopened the computer labs for the students. But I had experienced so many advantages from using ARES Kudo during the lockdowns that I wanted to continue with ARES Trinity, incorporating Commander and Touch. I took the opportunity to observe the differences from CAD teaching in the pre-COVID-19 period — and the results were terrific.

I compared three different classes in 2022 with classes of the same courses I taught before 2020. As a disclaimer, these comparisons are the experience of an *n1* study — that is, the account of what happened in my practice, and empirical observation of one sample. Although my goal was not to do a controlled case study with a large sample size, the results are strong enough to support my claims regarding my experience.

| Increased Learning Speed

The first result was that, on average, my classes that used ARES Trinity completed the discipline's teaching program 30% faster than previous classes that did not. I can attribute this to several factors, mainly engagement outside the classroom. Maintaining a productive learning pace is one of the best ways to make good progress through the course content. The interactivity tools were crucial in enabling my students to progress in the drawings outside the classroom, even when they had doubts. Because I could clarify any questions more quickly, they didn't have to wait for the next class or try to schedule a call with me.

This type of interaction does not mean the teacher is available around the clock. Still, in the time we had already planned for student assistance, I was able to answer up to 10 times more questions than I could if I had to receive them in person or virtually, open files, listen to the query, and speak my reply. When the students were able to leave specific questions in the drawing instead, I could go through the view-only links they sent and quickly respond — and that's it! Nowadays, it is rare that I have to start a class by taking questions from a past exercise.

I realized the magnitude of this improvement when, with about a month remaining in the school semester, my teaching program was almost finished. That is, all the commands, tools, and exercises I had planned, based on my previous experience of more than ten years teaching CAD, were already completed by the students. I was amazed. Of course, there is a considerable variation in learning speed from one class to the next. However, it is more common for me to struggle to fit in some final content than to conclude with time to spare. This semester, all three classes completed the base program well in advance of the semester's end.

| Ability to Expand Course Content

The second result that I can claim, which was due to the increase in learning speed, is that I was able to add content to the basic program of the discipline. Because we completed my program more quickly than expected, I had the time to teach new content and review exercises.

But what was more interesting was that I could also explore additional tools and further individualize teaching. As I worked with CAD for different programs, ranging from Agronomy to Real Estate Business to Work Safety, I integrated specific elements of their training into the drafting classes. This enabled a trans-disciplinarity in the teaching of CAD that was, until then, challenging for me. This content connection motivates students and helps them understand the application of tools. It allows for a conceptual link with the other disciplines of their major.

Don't get me wrong; I've always done this. The way I teach CAD to one class is naturally different from another class. But as I completed the fundamental part more quickly, I made the later exercises more complex, not only in the drafting content but in the specific connection to the students' major area. This was only possible because, at that point, the drawing program was no longer a hindrance — the students already had mastery of the essential tools.

And of course, because competency with collaboration and sharing tools is crucial in the modern workplace, students were finishing the program better prepared to join it.

| Significantly Better Student Performance

Finally, there is the improvement that I only obtained proof of after the semester ended: On average, my students' grades this semester were 15% higher than before I used ARES Trinity. All three classes that used ARES Trinity had a significant and relevant increase in average performance, considering content, participation, and grades, compared to the classes that did not use it. (Again, this was the example of one semester, with one teacher — myself — who compared classes of three different courses in different times: pre-COVID-19 using AutoCAD in the laboratory, and now, using ARES Trinity in ... any setting, anywhere.)

I know that any teacher reading this, CAD or not, would be impressed — and even a little skeptical. I'm also a researcher, and this data encourages me to investigate further. We still do not have significant larger, controlled studies comparing CAD tools in the school environment. The only thing I can tell you CAD teachers who are questioning the claims I've made is: Try it. Make your own class your n1 experience, and compare for yourself. And if possible, **tell me your findings!**

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Cloud CAD: What is it Improving in Education? A CAD Teacher's Experience

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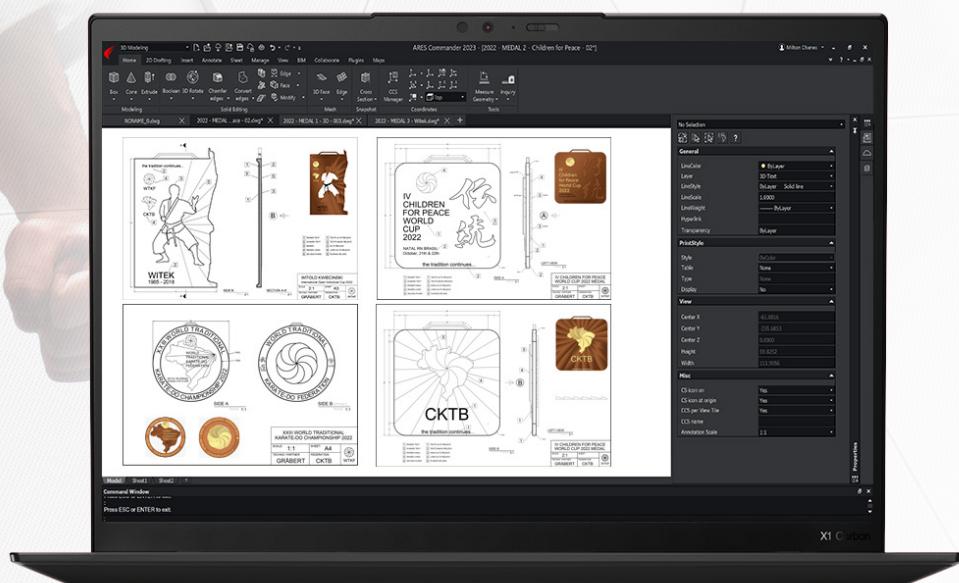
HOW CAD SOFTWARE AND COLLABORATION IN THE CLOUD HELPED TO ORGANIZE

THE XXIII WORLD TRADITIONAL KARATE-DO CHAMPIONSHIP 2022

As an international governing body of traditional karate, the WTKF asked Graebert to assist with its CAD expertise in preparation for the XXIII WTKF World Championship taking place October 17–22, 2022. In addition to developing the spatial design of the tournament grounds in Natal, Rio Grande do Norte, Brazil, Graebert also created 3D designs for the CNC-milled winners' medals. As a technology partner, Graebert — with its ARES Trinity of CAD software — was the perfect fit.

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