

11 Experts Share Their Top 3D Printing Beginner Tips

Let's be honest, 3D printing can be quite tricky. Home 3D printing technology is still immature and 3D printing beginners who just bought their first machine are faced with a multitude of challenges when it comes to getting reliable and repeatable 3D print results.

It is clear that a bit of expert guidance won't hurt! That's why we reached out to some of the top 3D printing experts and asked them the following question:



What are your top 3 helpful tips for the new 3D printer owner?

We asked the experts to share the knowledge and insights they have gained while spending hundreds of hours 3D printing and accumulating their fair share of failed prints. These 3D printing tips are irrespective of any 3D printer model or brand such that they are broadly applicable.

We have included a link back to each expert's website and social media profile in case you'd like to learn more about them and the work they are doing. Before we dive into the answers, we want to THANK all participants for sharing their hard-earned experience so freely.

Grab a pen, take notes and implement the info. Help to spread the word and share this post with your friends and fellow 3D printing enthusiasts!

J r mie Francois

I am a self-employed, open-minded, curious iconoclast. I help start-ups, research centers or small companies for their needs related to algorithms, sensors, data processing and mechatronics. Bragging stuff? Coded an award-winning pinball game on palm. Published a paper in IEEE. Drove my motorbike deep into Sahara dunes. Made a 20K-visit/month blog by chance. Swam in a warm volcano lake. Kept all my friends so far.

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- First, make sure that you understand that 3D printing at home is still not yet "ready for the average Joe", despite the hype that many brands brag about. Understanding how it works is (still) a must, as much as a natural tendency to be curiosity and to like tinkering. Only a few reliable printers may work out of the box (kits are often tricky). And even if you are lucky and if it works out of the box, you will have to solve complex problems soon or later, that are time and nerve consuming. Be patient and inventive!
- Do not print with a badly calibrated printer! Some printers are even delivered while not properly tuned, and price is not always a safe indicator! Check that everything is square, that the pulleys or belts are not lose, that the bed is level. Keep it clean. Right now, the forums are filled with years of ideas, problem solving and interesting experiences. So 99% of your own are probably already discussed in length. The hard part is to recognize it in the first place, which is often not obvious! Experience and practice are a must, and you will eventually know enough that something goes wrong by the sound it makes!

- Never focus too much on one single issue. These machines are complex, and a trouble often arise from multiple reasons. A slipping filament may not only be caused by a "bad" hobbled bolt or driving system, but also by an obstructed [nozzle](#), a wrong feed value, a too low (or too high) temperature...or a combination of all these! As a general rule, do not expect things to go better if you have to abuse any parameter (e.g. by raising the temperature or flow rate). Start printing with low temperature and low speed, and only then drift slightly around the settings so you learn the combined effects: each filament has its own best set of values. Knowing how to diagnose the printer is a huge win for a full experience.

Richard Horne a.k.a RichRap

RichRap is an Electronics Engineer, Product Designer, Salesman, and Problem Solver who has been working in a wide range of industries and applications, across many platforms and technologies for the last 20 years. Rich's interest and passion for 3D printing started in 2009 after visiting the [RepRap](#) project website. He started blogging, designing and developing with 3D printing shortly after. Having built his first 3D printer, The RepRap Developments And Further Adventures In DIY 3D Printing Blog started on Sunday, 13th September 2010 and has continued ever since.



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- My first general tip would be that when you first get a 3D printer up and running, print out lots of 20mm cubes. It's quite a boring object, but it can help ensure you have a well setup and calibrated machine. You can print these solid to test for over extrusion and size calibration. You can also print hollow to test for accurate perimeter width settings in your slicing program. This will also ensure better and more accurate hole size, model features and improved strength of parts when you have the perimeter width setting and [extruder](#) flow rates correctly defined.
- My next tip, which really follows on from the above, would be to get comfortable with nozzle to [print bed](#) adjustment - This sounds obvious but it's still the main thing people don't spend enough time on when getting started. And it's so important for successful printing.

Really don't ignore this aspect even if you have a 3D printer that automatically adjusts for a bed that's not vertically straight / level / tram / flat - these are all names used to describe a printing surface that is setup correctly. The more time you spend with your particular 3D printer, the more you will learn on how best to adjust it, and hopefully then keep it calibrated so you don't need to tweak it all the time.

The auto-level compensation in some 3D printers can add adjustments that make some prints look of a lower print quality or due to the compensation it may emphasize the layering especially on vertical surfaces.

So try to get everything vertically straight. The X,Y and Z axis should all be at a 90 degree angle to each other. This is actually still quite hard to do and prove. Printing cubes and testing them (measuring and checking it they are straight) after printing with a set square is still the best way to check it's all setup correctly.

Believe me, getting this setup and calibrated will save you so many print problems and adjustments later on.

- Then the same thing goes for print size calibration. When you print a 20mm cube, is it 20mm when measured? - if not check if it's a calibration issue with the machine. This can also be tricky to track down. Sometimes it may require an adjustment in the steps per millimetre settings in the firmware (more likely if you have built up a 3D printer yourself or from a kit) and very often it's just down to over extrusion of material causing an over-stuffed object. Experiment with extrusion rates, In my experience it's often better to be 10% under extruding than any level of over extruding. And a surprising amount of people are over-extruding without even realising it.

Jim Rodda a.k.a. Zheng3

Jim "Zheng3" Rodda is an artist best known as the designer of [Seej](#), the Open Source tabletop wargame designed to advance the state of hobbyist 3D printing through competition and player-directed evolution. Jim blogs about all things 3D printing at [Zheng3.com](#), and has dozens of models available for free download at [The Forge](#).



When he's not designing models or writing tutorials, Jim trains in Brazilian jiu-jitsu, studies Mandarin Chinese, and plays with more Barbie dolls than is healthy for a man his age. He's also planning a new crowdfunding project for later in 2015.

Blog: [zheng3.com/](#)

Follow Jim on: [Twitter](#)

- Win if you can, lose if you must, but always cheat. Your goal is to get a completed object off the print bed, not to have a magical machine that runs without human intervention. Use whatever tricks and cheats you can think of to make sure the print sticks to the bed. I've been known to pause the printer and super glue the first layer to make sure it doesn't go anywhere, especially on large, flat prints. A little post-processing with [sandpaper](#), filler, and paint goes a long way towards making nice objects you'll be proud to show off.
- Eat the elephant one bite at a time. Don't try to print too many discrete objects at once. One little widget getting dragged around by your tool head will quickly ruin the rest of an extensive multi-part print. If you're designing a model from scratch, test-print the tricky bits first by carving them off the main model. Autodesk Meshmixer is great for slicing a complicated model up into pieces.
- In theory, theory and practice are the same but in practice, they're different. Digital models change when they're birthed into the analog world. Cooling plastic will shrink an otherwise perfectly designed dovetail joint. Your printer might lay down a slightly wider first layer, throwing off your design by a few microns. Your haste to pull a warm print off the bed might warp it into unusability. Resist the temptation to print a scale model of a variable-speed transmission your first time out. Start with something simple and fast like [Robber Rex](#) instead until you gain experience with your printer's quirks and foibles. And please, for the love of whatever powers you hold dear, please don't print any more Yoda heads.

Filemon Schöffler

Filemon Schöffler and his family have a long history in printing. Around 1450, Filemon's grand grand grand father, Peter Schöffler, made the family's first move into the print business, working as an engineer in Germany, assisting Gutenberg with the development of the first printing press. After a short detour from the family in producing beer, which led to the infamous Schöfflerhofer, Filemon thought the time was right for the family to step back into modern printing, 3D printing that is. With a background in both Physics and Industrial Design Engineering Filemon hopes he's able to contribute in moving the 3D printing industry forward. Since 2013, he works as Head of Community at 3D Hubs.



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Follow Filemon on: [Twitter](#)

- Get to know your printer. The beginning is always difficult - test out all the different settings, try printing different shapes with different settings so that you start to understand your printer. At this stage, don't change materials too much as it will blur your results. A great test print to start with is [Marvin](#).
- Afraid you'll be not. Take it apart when needed, that's the only way to learn how to fix it. Also, it is part of the experience. "Stay calm and fix".
- Use the force. Join online 3D Print communities to learn from others. Stand on the shoulders of giants to reach even further. This will save you a lot of time and will color your 3D printing journey. There are many great printer specific forums. For an overall forum about 3D printing I recommend [3D Hubs Talk](#). ;-)
- Do, don't try. Most importantly, do NOT give up. You can make almost any design printable and almost any part of your printer replaceable. Also, 3D modeling is very important part of printing - keep that in mind.

Keep these principles in mind and turn yourself into a 3D printing JEDI Master!

To get you kickstarted:

- The nr.1 mission is for the filament to stick to the build plate - tape, [raft](#), glue are the best options for this.
- Make sure to always have your build plate calibrated (even the slightest difference can have a big impact).
- Changing filament can sometimes a little tricky- a little "human push" can help you a lot.

Clifford Smyth

Cliff Smyth is a long time user and innovator in the 3D printing space who is convinced that decentralized manufacturing has the potential to change the world. Feeling the need to share the core concepts that have helped him produce useful things with 3D printing he wrote the book: [Functional Design For 3D Printing](#).

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- 3D printing isn't quite like magic yet. It's getting there, but for most printers some careful thought about how your model will print is the key to getting good results. FFF printers (like most of the open source ones are) can't print on thin air, so models that have large overhangs will print much better if they are either reoriented to lie down on the print bed, designed to use automatically generated support for overhanging parts, or divided into separate pieces that can be printed without support. It takes a little practice to get the hang of what works best for your models, but the results are worth it!
- Get a little [digital caliper](#). They can be purchased for less than \$10 on Ebay or Amazon, and are required to accurately measure filament, calibrate your printer, and to adjust your utility - oriented prints for a perfect fit. They really come in handy for measuring stuff that you are trying to model too!

- Learn how to design your own models right away. Using [3D design software](#) is a little tricky at first for the beginner, but you will need to be able to design your own models from scratch to realize the potential of your printer. Making other peoples models is fun, but soon enough you'll want to tweak this, change that, or just start over from scratch with a better idea.

Even though the learning curve is a little steeper, you'll be better off if you quickly go towards a full featured 3D [CAD](#) program as soon as you have mastered the basics. You'll outgrow the “super easy” software really fast if you design much, and there are a lot of great, free software choices out there.

For making functional items, a good path is to start with Autodesk 123D Design (free) , as it will set you up with the skills to graduate to a full featured suite like Autodesk Inventor (free for student use!). If modeling characters or ornamental items is your thing, something like Blender might be a better choice.

Philip Cotton

Philip Cotton is the founder of the [3dfilemarket.com](#) an independent marketplace to share and sell verified 3D printing designs. He is also a full time educator who has been awarded the 3dprintshow educational excellence award for two consecutive years for his teaching of 3D printing to high school students. He has advised the BBC on 3D printing and also taught university students about 3D printing in education.



He was named as one of the top ten people to watch in 3D printing in 2015 along with Makerbot's Bre Petis and blogger Rachel Parks. Philip is an education ambassador for beethefirst 3D printers and is also a regular contributor to the 3D Printing Association.

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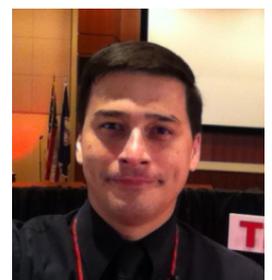
- Choose a 3D printer that has good support available from the manufacturer, preferably one from a local supplier. This way if you need help then you can access it on a local level rather than national level. If you buy a cheap printer from eBay and its shipped from China then if something goes wrong it could prove very frustrating to fix. If there's local support then this will be far easier.
- Find a good forum to engage in so you can see what 3D printing is all about. Members of these groups are really helpful and they can be a great learning experience. 3D printing is emerging at a rapid rate and keeping up to date with this will help you along the way.
- Learn to start designing using CAD. There are many [free/cheap programmes](#) to use e.g. SketchUp, Tinkercad, Autodesk Shapeshifter etc and start to model your own basic designs. There is nothing more satisfying then designing something yourself and then 3D printing it yourself. You can then even share these designs or sell them on the many file sharing websites out there.

Josh Ajima

Josh Ajima is a Northern Virginia based teacher who runs the blog Design Make Teach. As a teacher, he believes that he can make a difference by engaging students in the process of Making. On his blog, Josh shares his experience around 3D printing and digital fabrication in the classroom.

Blog: [designmaketeach.com](#)

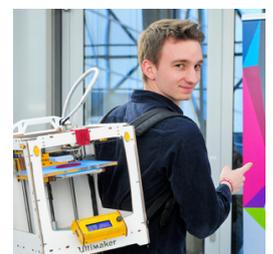
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- **3D Printing Philosophy for Beginners:** A 3D printer is a person not a thing. It is the combination of the person and the hardware that produces beautiful 3D models. The journey to becoming an experienced 3D printer can be difficult but is equally rewarding. 3D printing challenges the beginner to stretch themselves as a designer, maker, scientist and artist. Tips and tricks may ease the journey but ultimately the beginner has to take each step themselves.
The first step is the hardest. Unboxing new hardware and making the first successful print is the most challenging part for a new 3D printer.
- **Inspect** the printer to make sure it wasn't damaged in shipping. Rods can be bent, extruders can be jostled out of alignment, connections can come loose, glass build plates can crack, etc. Look for anything obvious that might be shipping related and report any issues right away.
- **Setup** the printer according to the manufacturer's instructions. It may seem straight forward but there are often restraining straps or brackets that need to be removed. Follow the manufacturer's recommendations for software and settings for the first print.
- **Level and Calibrate** the printer. It may be tempting to skip ahead and start a print but that can result in a scratched bed surface and jammed nozzle.
- **Slice** your model using the manufacturer's recommended [slicer](#) and settings. Try to adjust one thing at a time between prints and keep notes about the settings and effect on the print. Label test prints with a sharpie and take photographs.
- Don't use transparent filament for your first print. Clear filament is hard to photograph. You don't want the first photos you share of your 3D models to be out of focus.
- When photographing your models, use lots of light while avoiding glare. Try bouncing lights off a light colored wall or use an [inexpensive light tent](#). Use the sharpen command in your image editor to bring out the details of prints. Having a well lit photo with sharp detail comes in handy when asking for advice online or showing off your prints.
- Buy a roll of the manufacturer's recommended filament when you purchase your printer. New printers typically come with a small sample roll of filament. The samples can be hit or miss in quality. Being able to switch to a different roll of filament can be a useful [troubleshooting](#) tool. Cheap filament can be great but is more likely to be a headache when starting out. Ideally, buy two rolls of contrasting colors that look good together. Having two contrasting colors allows for mid-print filament swaps and makes for great multi-part models.
- Printing with **PLA** on [blue painters tape](#) is a great starting point. Be sure to wipe down the print bed with an alcohol wipe to remove any grease or grime from the factory before applying the tape.
- Getting the perfect extruder height is critical to great prints. I prefer the z-level to be set so that there is a very faint impression left on blue painters tape when removing a PLA model.

Florian Horsch

Florian Horsch is an active long-time member of the 3D printing community. After early work on the Ultimaker platform he co-founded HypeCask.com. The Bayreuth-based team focused on customer-specific 3D printing projects as well as contributing to the development and distribution of the huge Delta Tower machines. Since 2012 Florian shares his broad experience in the book *3D-Druck für alle* with a wide audience. Nowadays Florian is poised for the exploration of new frontiers in 3D printing.



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- Invest time into your 3D modelling skills! Don't get trapped in the "I need so see if that item is available on Thingiverse or Youmagine.com" dead end. Invest as little as an hour per week into your favourite CAD or modelling app and become a true creator of your very own items.

- Fix the weakest links until everything is perfect! 3D printing is like a chain, if one part of your printer isn't doing a perfect job, you won't get great results. By watching closely and getting in touch with the community or vendor you'll always find a way to improve the hardware, software or firmware. Never settle ;-)
- Print responsibly! Seriously, ensure good ventilation of your print cave and install a smoke detector nearby. There are too many fancy (and potentially toxic) materials and new (and potentially not fully tested/certified) machines on the market that you can't be sure that everything is as safe as your washing machine.

Charles Fried

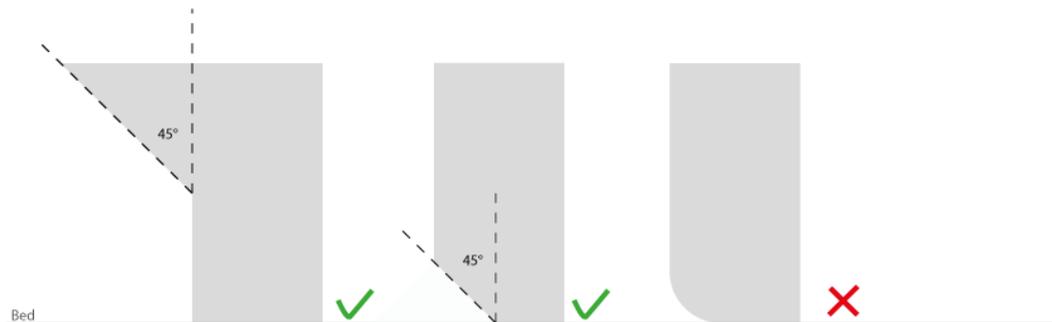
Charles Fried is a product designer aiming to be the forefront of the digital manufacturing revolution. He believes in a world where items are traded in a digital format and where automated customization would be at the center of the design process, increasing both personal value and functionality. Charles is currently studying for my MSc in Adaptive Architecture whilst also running Prodpoint.com a design & 3D printing service. Work seen on: Shapeways, Thingiverse, Reuters & many more



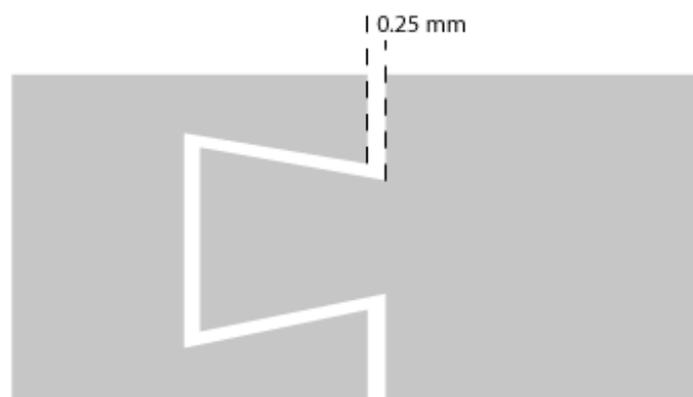
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- The 45° Rule, this angle is a rule of thumb as your settings (temperature, speed...) will affect this. It can be applied when designing for FDM printing in order to cancel out the need for support and therefore greatly improving surface finish.



- Tolerance (0.25mm), this rule applies when designing objects that should fit together. As a general rule each face of one of the part should be offset by this distance. As an example if you have a 10mm diameter hole the tube fitting inside it should be 9.5mm.



- Persistence, perhaps this is stating the obvious but there is no miracle when it comes to 3D printing. Getting failed prints one after another can be demoralizing but see each failure as an opportunity to learn and you'll soon get perfect prints.

Michael Sorkin

Michael Sorkin, is the co-founder of iGo3D, one of Europe's leading 3D printing retailers. Fascinated by 3D printing technology, Michael decided to launch Germany's first 3D printing retail store in 2013. Today, iGo3D has three retail locations in Germany and is expanding internationally. iGo3D is all about bringing 3D printing into the life of regular people. They offer a steadily growing selection of everything you need for your own 3D printing projects.



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- Start slow and look up the basic knowledge around the extrusion process, overhangs supports and retraction.
- Begin with easy to use, standard materials ([PLA/ABS](#)) rather than going crazy with nylon, flexible or even metal filaments!
- The 3D printing learning curve is steep, so be patient and don't become demotivated on the first print failures.

Nick Lievendag

Living and Working at the intersection of Creativity & Technology, Nick is co-founder of animation studio [Captain Motion](#), where he recently started experimenting with VR to complement the studio's 2D and 3D animation services.

In his spare time he is exploring the creative possibilities of 3D printing and shares his findings through his Blog, which includes 3D Printer reviews as well as articles about Filament and Software. Nick is based in Haarlem, The Netherlands.



Blog: nicklievendag.com

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- Focus on user experience instead of metrics when buying a 3D Printer. Maybe you're still deciding on which machine to buy as your very first 3D Printer. You're probably overwhelmed by the amount of manufacturers offering 3D printers in more or less the same price range. There's one big pitfall in your mission to compare them: comparing metrics which don't mean anything to you yet. You have probably put your shortlist to decide which offers the best value for money. On top of that list you've probably put measurable specs like speed and layer height. True, right? Because faster is better and smaller layers mean better prints? Possibly, but it's irrelevant. You'll want to know how accurate a printer is at a certain speed, but no manufacturer will tell you, because the answer is a whole lot lower than the listed maximum speed.

Compare it to buying a car: you won't buy a car that's very fast but performs terrible in corners. That's why you test-drive a car instead of buying one based on the specs in the brochure. It's all about user experience, something that is impossible to measure and largely based on personal taste and experience. Ideally you want to test-drive a 3D printer for a few days before buying, but no manufacturer let's you do that and commercial places to test the 3D printers are still scarce.

At this moment in time you do have a few options: Try to find [in-depth reviews](#) of the 3D printers on your shortlist, like the ones I write. Do search for actual hands-on user review, not paraphrased press releases by tech journalists. Another - and even better - option is to do a quick search on 3D printer network site - like 3Dhubs.com - to see which printers people in your neighborhood own! Send a same small design file (from Thingiverse.com for example) to a few Hubs and choose to pick up the result. When you do, chat with the owner about his or her 3D Printer. He or she will probably take all the time to talk about the pros and cons and there's a good chance you can see the printer in action. This is especially great, because it allows you to hear the amount of noise it makes. That's one thing I have discovered when testing different printers: they might be called "Desktop 3D Printers" but some are so loud I wouldn't want them anywhere near my desk. This way you can compare print quality and come to know a lot about the user experience of those printers, all within a week and for a few bucks.

- Explore the world of exotic filament. When I started 3D printing, filament choice was basically limited to [ABS](#) and PLA. Things have changed a lot since then and over the past year many new filament manufacturers have emerged. They're developing new materials as well as blending existing ones with all kinds of non-plastic particles. To get an idea about the great variety, look at the [Filament Guide](#) I wrote a few months ago. I'm currently in the process of updating it, because the amount of filament has more than doubled since I published it.

The thing I like about many of these new materials, especially the composite blends, is that they enable your 3D prints to be more than just plastic trinkets. They allow you to go beyond printing prototypes and make stuff that doesn't look and feel 3D printed anymore. For example, printing with filament that is a blend of PLA and metal particles - like [bronze](#) - can result in objects that seem to have been molded instead of printed, especially after polishing.

At this moment 3D Printing Filament is evolving much faster than 3D printers themselves. And in my opinion these filaments are the sole reason FFF (Fused Filament Fabrication) 3D Printers can stay relevant, because I expect other technologies - like [resin-based printing SLA](#) or DLP printing - to start dominating the prototyping market very soon.

- Explore design tools and start creating yourself! When making your very first 3D print, it doesn't matter what object you chose - it's magical! But while many casual 3D printing enthusiasts keep searching for new things to print on sites like Thingiverse, I like to encourage anyone to start exploring the vast variety of [software applications](#) that allow you to design your own stuff. This market is evolving even faster than 3D printing and filament combined and it needs to, because easy-to-use creation tools are essential to bringing 3D printing to the masses. There are many desktop-, browser- and tablet-based apps to design your own objects without having any experience with 3D modeling or CAD software. A good place to start is the free Autodesk 123D software range.

The first time you have 3D printed something you have designed yourself, metrics like printing speed become meaningless and you'll experience that magical feeling you had when you made your first 3D print tenfold. And do share them with the community, because when other people start printing your design and posting photos of it, 3D printing reaches a level of community interaction that no other technology offers: your designs physically entering - and maybe even enhancing - the lives of people around the world.

Wrapping It Up

There you have it – the experts have spoken! This is what you need to do next:

1. Take at least two of these proven 3D printing tips and apply them when doing your next 3D prints.
2. Help spread the word about this expert round-up. We want a maximum number of people to learn from these tips.
3. Leave your comments and questions below. Also, feel free to report back once you have implemented a few of the tips.

Did you like this post? Try these:

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