

High School Students Solving Third-World Problems with 3D Printing

Jack Waters and Jacob Dubner, in Uganda, training Village Health Teams with the ORTube

Students at **Winchester Thurston School**, in Pittsburgh, PA have the opportunity to learn engineering and design skills and are turned loose with only one requirement: **they must develop a product that helps people**. This unique mix of pedagogical practices, fusing product development and altruism, often results in an extraordinary process of thoughtful problem-finding and creative problem-solving.

In October of 2016, two seniors - Jack Waters and Jacob Dubner - submitted a proposal to develop a simple tool that could help combat diarrheal diseases, such as cholera, in developing nations. **Their research highlighted major issues** in current best practices associated with fighting the symptoms of these diseases, specifically with the use of **Oral Rehydration Solutions (ORS)**.



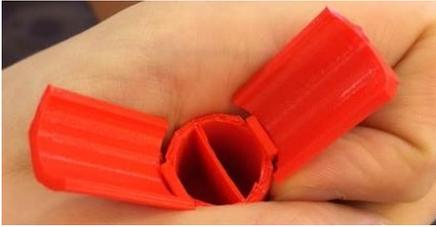
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THE PROBLEM: ORS is usually made by adding water to a pre-measured packet of salt and sugar, or measuring out the individual ingredients. The pre-measured packets are frequently out-of-stock and the current “suggested” methods of using a pinch of salt and palm-full of sugar results in inaccurate concentrations.

JACK AND JACOB’S SOLUTION: The creation of the ORTube, a simple, yet effective measuring device that would allow anyone to properly create ORS for those in need. Jack and Jacob began to iterate quickly, testing a variety of ways to both transfer and measure the salt and sugar into their tube. Below and to the left are some of the unsuccessful models.

Early Attempt To Incorporate a Funnel



Location to Add Solutes Near Cap



First Batch Of Ortubes Being Tested By VHT's In Uganda During Summer Of 2017



In the summer of 2017, after graduating from Winchester Thurston, Jack and Jacob began their relationship with Omni Med, a nonprofit that trains Village Health Teams (VHT's) to administer ORS in Uganda. Omni Med ordered a small batch of ORTubes with instructions; and the ORTubes were field tested by Village Health Teams in Ugandan villages.

MANUFACTURING ORTUBES: In order to successfully deliver on the ORTubes for Omni Med, the students turned to the **MakerGear M2** printer for production. Throughout their iterative design process Jack and Jacob really dove into the process behind 3D printing and the difference between the variety of printers we have at Winchester Thurston. The **MakerGear prints reliably and quickly**. The students often setup 6 ORTubes on the printer and let it run for 18+ hours, always returning to successful prints. The team experimented with a variety of plastics and nozzle diameters, settling on a 0.50 mm nozzle and using an FDA-approved, dishwasher safe, high-temp PLA. The ability to quickly change out V4 extruders on the M2 and fine-tune the temperature settings of both the extruder and the heated bed ensured reliable and repeatable prints every time.

Armed with feedback from the field testing, Jack and Jacob began to re-work their design and continued to develop their relationship with Omni Med while successfully navigating their freshman year of college.

In June of 2018, Jack and Jacob again used the MakerGear M2 to deliver a fresh batch of ORTubes to Uganda. This time they traveled to Uganda with Omni Med to personally train the VHT's and experience life in Uganda as they collected data on the use of their device.

Jack and Jacob are currently looking for funding to mass-produce their ORTube, hoping to get them into the hands of thousands of VHT's working across Uganda and beyond.

For more information on how to support this project please contact Graig Marx at DesignToMakeADifference@gmail.com or follow on twitter: @designtomake; Facebook: <https://www.facebook.com/DesignToMakeADifference/>