



**CALIFORNIA STATE SCIENCE FAIR  
2015 PROJECT SUMMARY**

<b>Name(s)</b> <b>Hannah A. Edge</b>	<b>Project Number</b>  35178
<b>Project Title</b> <b>3D-Printed Bluetooth Android-Based Spirometer with HIPAA-Compliant Secured Cloud Data Storage</b>	
<b>Abstract</b> <b>Objectives/Goals</b> Asthmatic and COPD patients need portable digital spirometers because they are optimal tools in determining their lung capacity and detecting changes in lung function in a more accessible manner. This results in a better evaluation and treatment of earlier exacerbations and reduces ER visits and healthcare costs. It also involves and encourages patients to take an active role in monitoring their symptoms. <b>Methods/Materials</b> Creo ProEngineer; ProJet 3510 HD; VisiJet M3 Crystal; EAGLE; SmartDraw; Eclipse (Java); Android SDK; 2 circuitboards ;Circuitboard components: ; 1 red LED light; 1 green LED light; MPXV7002DP air pressure sensor; CC2541 Bluetooth module; 2 NPN transistors; 17 fixed resistors; 1 toggle switch; 10 nonpolar capacitors; 1 button; 3 AAA batteries; WQS-8888 Spirometer/Calibrator; Google Cloud Service. <b>Conclusions/Discussion</b> The spirometer prototype had an approximate 4% error rate and variation of .14 L, complying with the American Thoracic Society's standards. It demonstrates a cost-effective, portable, durable, user-friendly solution by resolving the issue of having costly desktop spirometers.	
<b>Summary Statement</b> This project identifies an inexpensive approach in the development and structure of a portable, compact spirometer; merging new technology such as 3D printing, Bluetooth, Android & Cloud for the gathering and determination of lung function.	
<b>Help Received</b> Schematic diagram reviewed and corrected by Mr. Cai, suggestions on Cloud provided by Professor Breaux of Carnegie Mellon	