



LVEM 5 User Profile: Dr. Wesley C. Sanders

We recently talked with **Dr. Wesley C. Sanders**, professor in the Engineering Department at Salt Lake Community College. Dr. Sanders is innovating in higher education by bringing hands-on experiences using advanced electron microscopy techniques to sophomore level undergraduate courses, bringing what historically was reserved only graduate level courses to earlier training opportunities. In this conversation, he shares about his use of the LVEM 5 in this course to enable hands-on training for the next generation of scientists and engineers. This interview has been edited for clarity and length.

Hi Dr. Sanders. I'm excited to learn more about you, and how you've used the LVEM 5. To start, can you please tell our readers a little bit about yourself?

My name is Wesley Sanders. I received a Ph.D. in Chemistry from Virginia Tech in 2008. After receiving my Ph.D., I started working as an ASEE Postdoctoral Researcher at the Naval Research Laboratory in Washington DC. I've

been working at Salt Lake Community College (SLCC) since 2010. I started out as an instrumentation lab coordinator. I became a faculty member in the Engineering Department in 2013. As a faculty member, I've published two books, Basic Principles of Nanotechnology and Atomic Force Microscopy – Fundamental Concepts and Laboratory Investigations.

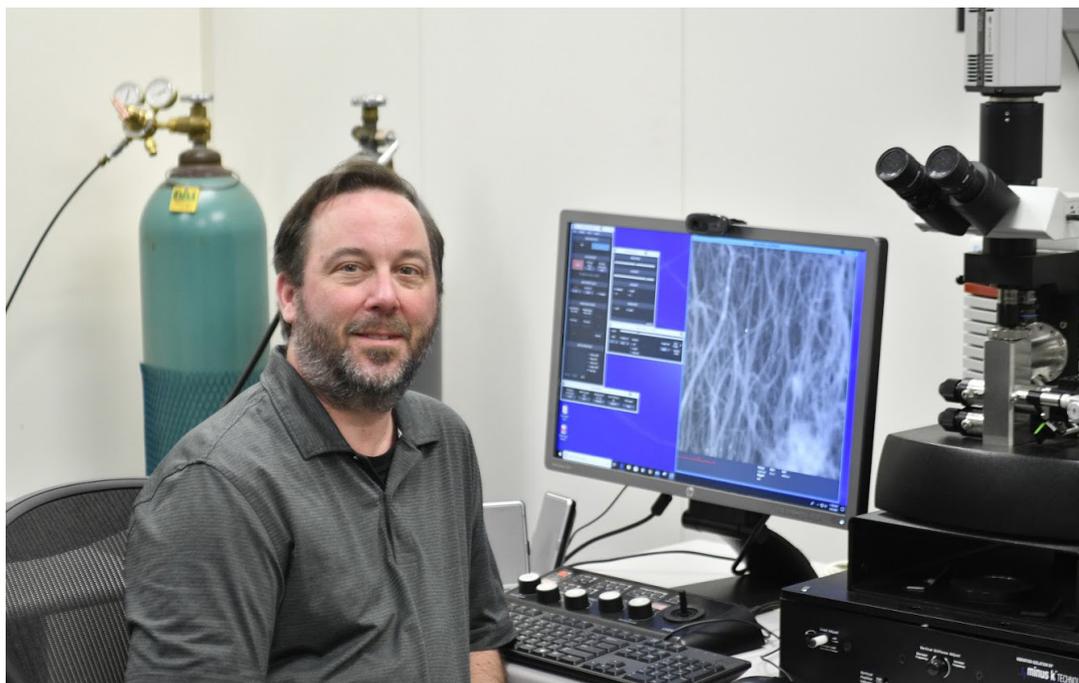
I understand you have the LVEM 5, and use it in a semester long electron microscopy course. Can you share an overview of the lecture and lab course, and the inspiration for the course design?

Our electron microscopy course is entitled MSE 2330 – Introduction to Scanning Electron Microscopy. This course is part of our microscopy certification of proficiency program.[1] The first half of the semester-long course provides a basic overview

During the covid pandemic, the microscopy lab technician trained students remotely using Zoom.

How hard is it for the students to learn the technique?

Students do not have difficulty learning how to use the LVEM 5. Lab videos prepared by our microscopy lab technician ahead of time that describe LVEM 5 operation (especially sample insertion and removal) allow students to review the process prior



The microscopy lab technician, Glen Johnson, provides students with training and supervision.

of the operation of scanning electron microscopy. Students learn the importance of key parameters used in SEM imaging during lecture. During the lab component students apply knowledge learned in lecture to actual SEM instrumentation. Energy dispersive X-ray spectroscopy (EDS) is also covered in lecture and a corresponding lab is performed during the same time. The SEM mode of the LVEM 5 is used during the lab component. The second half of the semester is devoted to TEM. The lecture component of the course addresses the key parameters associated with TEM imaging, in addition to basic TEM operation. In lab, students are guided through the usage of the LVEM 5 operating in TEM mode with our microscopy lab technician.

How do you use the LVEM 5 in the lab portion of the course?

Prior to the covid pandemic students used the LVEM after receiving adequate training from the microscopy lab technician and under supervision.

to conducting the next step. When students watch the lab videos, prior to attending the lab, better operation performances are observed.

I think many people have a fear around this next question. Have you encountered any issues with students accidentally breaking the instrument while learning? Or said differently, how robustly has the instrument help up during the lab course?

The microscope is very robust. It has held up during student use. Our microscopy lab technician demonstrates use of the microscope prior to student use, in addition to the lab videos he prepared for viewing prior to student use. Heavy emphasis is placed on the insertion and removal of samples.

Do you have plans for additional courses utilizing the LVEM 5?

Yes. Currently, we are focusing on developing the TEM portion of the electron microscopy course further. Developments include preparing and imaging

a wide variety of nanomaterials synthesized in house (i.e. carbon nanotubes, silver nanoprisms, and quantum dots).

Now for some rapid-fire questions; What advice do you have for someone who would like to develop a similar course at their institution?

Reach out to other faculty at different institutions teaching similar courses to get ideas.

What are your favorite things about the instrument, now that you've owned it for some time?

The LVEM 5 can achieve very large magnifications.

Where did you decide to place the instrument?

The LVEM 5 is located in our microscopy lab (basement floor).

Is this a shared resource for other researchers at your institution?

The LVEM 5 is available for anyone in the scientific disciplines at our institution to use.

How many users get trained on the instrument each year?

2–9 users get trained on the LVEM 5 each year.

What is the most exciting moment you've had using the LVEM so far?

Imaging carbon nanotubes.

And finally, do you have any advice you'd like to share for students considering careers in STEM (Science, Technology, Engineering, and Math)?

Stick with it. It will reward you in the end. STEM fields can open doors. One of the many advantages of a STEM field is the fact that these fields can be applied over a wide variety of disciplines. A STEM degree can put you in a good position to secure stable, essential employment.

That is wonderful advice! Thank you for taking the time to share your stories about your exciting use of the LVEM 5, training the next generation of scientists to use this instrument.

References:

[1] <https://www.slcc.edu/microscopy/index.aspx>

Sanders WC. Basic principles of nanotechnology. CRC Press; 2018 Jul 11.

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About the author:

Robert I. MacCuspie, Ph.D., has over twenty years of experience in nanotechnology and materials characterization. Career highlights include leading the team that developed the silver nanoparticle reference materials at the National Institute of Standards and Technology, the first faculty and Director of Nanotechnology and Multifunctional Materials Program at Florida Polytechnic University, and over five years of consulting at the business-science interface from MacCuspie Innovations, helping companies commercialize and educate on technologies to improve human health.
