If Xin Qian had his way, all graduate students in experimental nuclear physics would get hands-on experience working with equipment. Qian, who has been awarded the 2010 Jefferson Science Associates Thesis Prize, credits his success to the hands-on experience he gained while working on his Ph.D. at Jefferson Lab.

“Nowadays, the experiments are becoming bigger and bigger, and a lot of students do not have the chance to work on hardware, but focus on analysis and simulation. In simulation, if anything goes wrong, you can just go back and redo it,” Qian explained. “But when you work with hardware, if you make a wrong move, it will cost you a lot. So, I think those kinds of experiences are very precious.”

In addition to working on the hardware before his Ph.D. experiment, Qian also had the opportunity to support the experiment by monitoring data taking during the experimental run.

“I worked very hard every day during the data taking. It was actually quite a fun and exciting experience to catch all the random problems that pop up during the run and to solve them on site,” he said.

Qian was presented with the thesis prize at the 2011 Annual Users Workshop and Meeting, held at Jefferson Lab June 6-8. Qian earned his Ph.D. from Duke University in May 2010.

“After a lengthy but rigorous process of selection among an outstanding set of applications, Dr. Qian’s thesis emerged as the favorite. Although, in the end, one winner had to be chosen, both committees reviewing the applications were impressed by the quality of the submitted theses,” said Zein-Eddine Meziani, Chairman of the Users Group Board of Directors, who issued the prize.

Qian’s research was focused on filling in gaps in the scientific knowledge of the fine details of the building blocks of the nucleus, the so-called nucleons that are more commonly known as protons and neutrons. He and his colleagues were interested in the nucleon’s constituents, called partons. To learn more about partons, the researchers measured the transverse momentum distributions of the nucleon.

“We are trying to understand the nucleon. The transverse momentum distributions are basically talking about the three-dimensional momentum space – how these partons move,” Qian explained.

While other experimental efforts have measured the momentum inside the proton at high precision, Qian said this experiment is the first to offer a precision measurement of the quantity inside the neutron.

“These are the best neutron results in the world, a precision measurement in the valence region. We did a challenging experiment, and we did the best we can,” he said. The results of this work have been accepted by Physical Review Letters.

Qian is currently a second-year Robert A. Milikan Postdoctoral Scholar at the California Institute of Technology, where he works on the Daya Bay Reactor Neutrino Experiment, based in China, and on R&D for Fermilab’s proposed Long-Baseline Neutrino Experiment.

The Thesis Prize was established in 1999 by the Southeastern Universities Research Association, the predecessor management and operating contractor for Jefferson Lab. It is awarded for the best graduate student thesis related to Jefferson Lab research and includes an award of $2,000 and a commemorative plaque. Four areas are considered in rating a submitted thesis: the quality of the written dissertation, the student’s contribution to the research, the work’s impact on the field of physics and service (how the work benefits Jefferson Lab or other experiments).

The Thesis Prize is one of many projects supported by the JSA Initiatives Fund, a program funded by JSA owners (SURA and CSC) to support efforts that further the scientific outreach and promote the science, education and technology missions of Jefferson Lab and the lab’s user community. The program is administered by the JSA Programs Committee. For more information, see http://www.jsslcd.org/IF/IFIndex.html.

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