KIDD AT HEART

Math, chemistry, physics, and engineering mixed with logic and rational thought are the perfect combination for a rewarding career. This is what Dr. Tim Kidd of the University of Northern Iowa Physics Department looks forward to everyday. He recalls, as a 10-year-old, being asked what do you want to be when you grow up and answering “I want to be a mad scientist.” He knew he wanted to have cool and crazy toys and be able to “make stuff.” Mission accomplished.

Dr. Kidd supervises three physics labs. Within these labs he conducts research and experiments with the assistance of UNI undergraduate students. He encourages the students to play with the resources and tools in the labs. He estimates that the labs are worth about two million dollars, which he says is “Amazing. It is beautiful to have that many things [equipment and tools] available.” The undergraduates who assist with his research are not only physics majors but include every science, math, and even some business majors. Dr. Kidd says “If you are interested in science and an undergraduate at UNI, look into working with us because we have a lot of fun toys. As long as you are curious and can work independently, we want you.”

Dr. Kidd’s favorite thing about working with undergraduates is the moment when they realize that they may know more about an experiment than he does. At first, students see questions about experiments as if they are test questions. They believe he already knows the outcome. Sometimes this is the case, but Dr. he reminds the student that he did not do the experiment himself and does not know what was observed until the student shares what happened in the experiment.

Dr. Kidd tells the students, “Don’t let me pollute your findings. My intuition could be totally wrong. If you are wrong, who cares? It doesn’t matter. What did you learn?” After students get over the fear of being wrong, then they begin to build confidence, do their own analysis, form ideas, and start to have fun with the learning process. The students also become more accepting of an idea being questioned and no longer take it personally, but learn from it and move on.
Learning how to fail is something that Dr. Kidd truly believes students need today. As a professor, he sometimes sees a lack of willingness to try because of the fear of failure. Students are afraid to write their own ideas down on paper because they are afraid of the judgement. He encourages students to get hurt, work it out, recover from emotional trauma because he says, “If they never fail, how will they know what they are good at? Just do something. What is the worst that can happen? You break something.” Dr. Kidd says that his own past failures and struggles helped him find out what he truly enjoys, what he is good at, and what he is not good at.

One of Dr. Kidd’s areas of research is nanoscience. Nanoscience is the study and control or manipulation of very small things such as atoms and molecules. In one case, Dr. Kidd and his student assistants broke down cellular fibers using an ultra-sonic probe. Each molecule of cellulose then separates and gets surrounded by water. After it is freeze dried, the material looks like cotton candy as it is approximately 99.98% air. There is not much material in relation to surface area. It is so [not dense] that it is not immediately felt when touched.

Similar research with magnets is also taking place in one of his three labs. Using these magnets that are mostly air (fluffy and ultra-light), Dr. Kidd and his research assistants are investigating what can be done with a magnet that is not very powerful but weighs less than a gram.

Making composite materials and layering different materials are another project undergraduates are researching in Dr. Kidd’s lab. They take layers of non-magnetic materials (such as semi-conductors or various metals) and sandwiching magnetic ions in between the layers. This layering allows the researchers to control the magnetic strength and interactions of the material. They do this by changing which elements or compounds are used, and the depth of each layer.

As an undergraduate, Dr. Kidd majored in Engineering Physics at the University of Illinois Urbana Champaign. At the time he did not know what field of engineering he wanted to pursue, so he took courses that were the basis of all engineering disciplines, physics being one of these. He explored other engineering areas, talked to friends coming back from internships and even met with professionals. Dr. Kidd felt that the majority of the engineers and his engineering classmates with whom he spoke were accomplishing similar tasks in process control and systems improvements. He did not want to do these aspects of engineering for his career. Again, he wanted to create objects using various tools. One of the primary building blocks of engineering is physics and he was successful in these courses. The result was Dr. Kidd obtaining a Ph.D in physics. He then spent two years at Brookhaven National Laboratory conducting postdoctoral research studying nanomaterials and high temperature superconductors. High temperature superconductors are materials that have little to no electrical resistance at extremely high temperatures.

As a graduate student, Dr. Kidd became a teacher’s assistant (TA) for a class and found that he was pretty good at it. He liked the small group
communication and helping students understand the material. His experience led him to want to have a career that blended teaching with research. This idea is what brought him to UNI.

This is Dr. Kidd’s 12th year at UNI. He has supervised over 70 undergraduate students and a handful of graduate students. Working with these students is what he believes a big component of his job should be. “Doing real research and having students involved in it is what makes UNI stand out,” he says.

Dr. Kidd was recently awarded an Iowa Space Grant Consortium Curriculum Redesign Grant. This grant will allow Dr. Kidd to develop a self-contained laboratory activity manual for teaching electronics at different levels from high school to graduate level. The instruction is goal oriented and different than how many of us have been taught — theory then practice. The students start by making something, such as a robot, then they work backwards to understand the what, how, and why. This way the student has motivation to learn because he will know that he will be making a cool robot. If a student makes or simulates an actual thing, learn about the individual components that goes into it, then a better understanding of the subject matter can be obtained and students are more likely to remember key concepts and processes. The experiments start simple in the basic classes and build in the next class questioning why, possibly building a power supply, sensor, etc. themselves. When taught to upperclassmen, the theories behind each build are discussed.

Dr. Kidd encourages students to get out of their comfort zone, try new things and find what you are good at. “It is ok if you are not good at something. Don’t make that your career. Make it your hobby if you really like it. There are a lot of things that you can be awesome at,” he says. Find out what you enjoy, pursue it, and then play.

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-Dr. Tim Kidd, UNI Physics Professor

Dr. Kidd demonstrates a three chambered oven. Gasses and humidity are analyzed as they are pushed through the chambers to experience three different and increasing temperatures.