FYI

Practical Training in NDT
by Joseph Clasen

Why do we use practical training in nondestructive testing (NDT)? The answer may not be as simple as you think. The simple answer is that practical training is required in any NDT training program, but the more complex answer is that not only is it required, it truly is more effective than the typical lecture style training that is used as the mainstay of NDT training. Not to say that lecture is a bad thing; in fact, lecture style learning is a great way to convey basic NDT knowledge that technicians use on a daily basis. NDT has been taught many different ways for many years, and during this time, many different industries have put their particular spin on it, which is actually a good thing. So, presenting information in several different manners helps to solidify as much of the basic knowledge as possible. This article takes into consideration one course, Ultrasonic Testing Level I (UT 1).

In the typical 40-hour course, UT 1 could be used as a lecture course to explain the basic principles of ultrasonics and how sound waves act inside of different materials. ASNT provides material to base the course on, which is more than likely how most people teach their UT 1 course. In the past two years, transforming UT 1 into a hands-on lecture course has been a major goal. What is meant by that is, when lecturing during a UT 1 course, having the students using the equipment during the lecture allows them to apply the lecture terms at the time that they are discussed. What this will do is greatly increase the retention of the students’ learning, which can be easily measured through the Level 1 general tests that are administered throughout the course.

Retention Rates
In order to understand the application of the hands-on lecture style classroom, it is first helpful to know some basic information about people and why they are the way they are. The average sustained attention span is only approximately 40 minutes, which is part of the reason that most people take a 10-minute break during the hour. This allows students to renew and refresh on the topic that is being discussed. If a person is unfocused on a task, his or her attention span is as low as 8 seconds. So, if you happen to be in a lecture course and are not that type of learner, (which many NDT students are not), you will be in trouble if you have to sit and listen and are expected to retain the material (Figure 1).

Coming back to the UT 1 course, it can now be seen that within a 40-hour course it becomes very difficult to maintain high retention rates by only lecturing on the material. One way this can be helped is by lecturing for approximately 45 minutes and then taking a break. Upon returning from break, instructors can set up the UT equipment, which ranges from any portable flaw detector/transducer setup that can be imagined. This is also another good thing to point out: the
more comfortable a person is with many different types of
equipment, the more comfortable he or she is out in the field.
While utilizing an International Institute of Welding (IIW) block,
the students then have the opportunity to put what they just
learned into action. In order to have the true hands-on lecture there
has to be lecturing while also working with the equipment. For
instance, when discussing near-field length, it is much easier to have
two different transducers on hand and have the students plug them
in and look at the initial pulse length to visualize and understand
that near-field principle (see Figure 2). From there, students can
then see that there is an actual difference in how transducers
perform. After that they can see the differences of the transducers
themselves. Students can then start looking for the
1.52 mm (0.06 in.) hole that is located on the IIW block. After
talking about near field, it can then be discussed how different
transducers have different sensitivities and how the near field plays a
big part of that sensitivity.

The reason for switching to a hands-on lecture is pretty simple.
Taking a look at Figure 3, it can be seen that people retain
information differently. It is obvious that lecture style teaching is
more difficult for individuals to learn from (TubeMogul, 2008).

As you can see, by having students immediately use the material
that was lectured on, they should be much more able to remember
it. There are some other things that can be done as well in the
classroom that are slightly unconventional. One of them is to use
YouTube as a learning device as well as a distraction tactic. The
reason for this is if a person has anywhere from an 8-second to
40-minute attention span, it is important to refocus his or her
attention every few minutes. During a lecture, YouTube is a great
way to show a 30 to 40-second classroom appropriate distractor to
help students re-focus on the material.

Additional Ways to Maintain Focus
There are also other things that can be done inside the classroom to
help students focus their time and energy on practical applications
within NDT. As an instructor, it can be difficult not to become too
hands on when it comes to the practical training. What happens is
the instructor just does the practical application for the students
without letting them struggle and find out for themselves what they
need to do in order to figure out a problem. This only prolongs the
problems for the students as now they have been improperly trained
on how to perform the practical application. What can be done is
to become totally hands off for a period of time in order to let the
students struggle with what they are working with. If students have

Figure 2. Differences in initial pulse response from equal size and
frequency transducers from the same manufacturer.

Figure 3. Percentage of retained information by learning technique.
to struggle with the material, that means a couple of very good things: first, that they are in fact focusing on the materials; and second, if they are indeed working on a practical application within NDT, they have to learn it to figure it out, so they are actually setting themselves up to retain more of the information that they are learning (Cumberland, 2014). As mentioned earlier, having to become hands off from time to time can become a challenge. An example would be first lecturing on the material, and then working together on the practicals that have to be performed. After a class demonstration, the students work in groups on the laboratory exercises to help solidify the theory and practical knowledge (Figures 4 and 5). At that point the idea is to become invisible within the classroom. That does not mean the instructor should go to his or her office and wait around until somebody has a question. What that means is that during the class, instructors can say that students’ questions will not be answered for a given period of time, for example 10 minutes. This should be prefaced by saying that there are 15 other people in the room that just heard the same lecture, and have seen the same demonstration and they should feel free to ask their peers any questions that will help them during their lab time. During that time, instructors can walk around the room and observe how the students are working in their groups and help them if they get too far off course. The main reason for not answering questions is simple: if the students are working together in groups as well as going back and forth to ask others questions during the class, they will have to understand the material to ask the questions and then reapply the knowledge on the equipment.

Doing these things is only half the battle; truly, the responsibility does ultimately lie with the students to engage in the material and care about what they are working with or all efforts are wasted. It is important to understand that not all people care as much about NDT as do professionals in the industry, but they really appreciate the fact that they stay safe when they are on an airplane, a rollercoaster and so on. Prepared technicians in the workforce are exactly what the industry needs, and preparing students to enter the workforce is what training centers and schools are doing now so that when the technician begins working in the industry, they are more capable of problem solving as well as technically applying the principles that they have learned during their training time. Practical training is the best way for students to learn what they need to know. Therefore, pairing the practical applications along with the lecture material is exactly what these students need in order to be successful in their careers.

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REFERENCES
