Using Technology to Enhance Learning About Construction Materials

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Abstract

Educators are faced with new challenges in teaching, due to the expanding and dynamic methods by which information and data are conveyed. Computers, internet, digital cameras, instant messages, communication software, and distance learning are some of the examples of our new age. These developments have raised the expectations of engineering students.

Part of the new culture being formed, that affects us as educators, is the fact that our students are entering our classes with simple but powerful expectations; (a) I can, with reasonable effort, observe (see a visual image of) most complex behaviors and, (b) I should be able to do this at any time that I feel it is suitable for me, at any time I am ready for learning. (c) My time is valuable. Teach me in a way that is most efficient for me. Cut to the most important things I need to know and convince me why I need to know them.

Much has been written about distance learning and how degrees can be earned from offices and homes. That is not what this paper is about. It is about optimizing time and learning with a mix of instructional delivery styles.

This paper describes the first phase of a project to integrate visual and auditory tools in teaching the details of standard test methods of construction materials. It explains the steps by which a set of videos and text were developed to offer engineering students an opportunity to visualize details of testing materials and assess their knowledge at the time they choose using the internet.

The benefits gained by integrating these tools, such as reduced time for laboratory sessions, standardization of the quality of the teaching process, and more effective use of hands-on

learning time, are presented. Assessing the true impact on learning is a more difficult challenge and these challenges are discussed.

There are a variety of learning theories that outline how different categorical modes, such as visual, auditory, and kinesthetic (feelings and sensations), play a role in learning. The match of these theories with multiple delivery styles pursued in this project is discussed. New tools could offer an opportunity for us to better teach engineering principles and to make our classes more dynamic for students, regardless of their learning styles.

The New Learners and Learning Environments

As educators, we are one of the important components of the learning process. Some claim that we are the most important component; we are the engines for learning. After all, we are responsible for the content and the direction that classroom learning takes. To be an effective educator (engine), obviously we need to deal with the other components, which include "the learners", and the learning environment. Nothing new!

What is new is the type of learners coming to our classrooms and the variety of learning environments that these learners are exposed to before they appear in our classroom. Increasingly, our society learns from the convenience of their homes at any time and day that suits the individual. As educators, many of us have observed a significant change in students' learning styles, their classroom expectations, and the classroom dynamics/participation during the past 5 to 10 years. The causes of these changes have not been scientifically quantified to our knowledge, but examining the trends in use of the Internet and electronic media provides indicators about the environments that students are now using to obtain information and to learn. We cannot be left behind and we have no choice but to interact with our learners and to sort through the options for the most effective methods for teaching. In fact, we have a new responsibility to use new methods to enhance the learning process, to make instruction more time efficient for students and teachers, and to be more available to our learners.

The model of perceptual biases developed by Bandler and Grinder [1] holds that in our culture we receive and process information using one or more of three modes: Visual (V), Auditory (A), and Kinesthetic (feeling and sensing) (K). This VAK model is recognized by many educators and used in many settings to enhance the understanding of the learning process. We, as learners, vary in our learning styles. Some of us learn better by the V mode, while others need the K mode to fully understand the subject. It has been a continuous challenge for educators to balance the delivery of information to cover all VAK learning modes. There are some aspects of engineering theory that cannot be delivered following the K mode. We cannot sense mathematical equations, for example, but we can, perhaps, show how a mathematical equation fits certain sets of data, and thus, give a sense of the nature of the equation. We can write on the board and thus deliver an equation in the visual mode and ask students to copy it in their notebooks so that they can sense writing it. What action constitutes or qualifies for each mode is not standard and we have our own biases in defining learning modes. The point is that our biases come from our experiences and thus, we need to consider the experiences of our students, our learners. Computer-based learning is becoming a common experience for our students and we need to exploit it to our advantage and their advantage.

Changes in Learning Responsibilities

Computer-Based Learning is a teaching advantage because it can cover the visual and the auditory learning modes effectively. The content can be carefully prepared once to the highest standards and then offered to the students continuously over a time span. It can be placed in a secure environment under educator control which avoids confusion or misinformation that can sometimes be generated inside and outside the classroom. More importantly, it can shift the responsibility of learning in a classroom, or a laboratory, toward the learner in a favorable fashion.

One of the accepted models of learning is described eloquently by Waldheim [2]. There are three levels of learning: Knowledge - recall facts, Comprehension - understand and correctly explain, and Application - apply facts in new situations. We, as educators, commonly assume the responsibility for all levels. With the new learning tools, it is plausible that the responsibility for the first level (Knowledge) could be shifted to the learner using the A and V tools available on computers. In addition, parts of the second level (Comprehension) could be integrated, such that learners would take the lead responsibility in this learning stage. Classrooms and laboratories would be reserved for the higher levels of learning, including comprehension of complex concepts/phenomena and applications to new situations. These higher levels usually require the K mode, sensing and feelings.

This new distribution of responsibilities is to our learners' advantage, because it allows them to be in charge of the knowledge-stage learning environment. It also allows them to repeat the process as often as they want, to focus selectively on concepts each individual may find difficult. It offers two modes of learning (A and V) and, thus, accommodates their learning biases without educators' interferences. More importantly, it will challenge educators to focus on higher levels of learning, particularly application to new situations, which is critical for the applied engineering field. These changes are expected to offer a more effective learning experience.

The Challenge of Teaching Construction Materials Testing

Construction materials technology is a required core subject for civil and environmental engineering education. What is unique about construction materials is that a majority of these materials, such as portland cement concrete and asphalt concrete, are produced locally and constructed on site, which mandates extensive testing for quality control and quality assurance. It is thus important that engineering students acquire knowledge of test methods, comprehend concepts behind these methods, and be able to apply test information in new situations. Traditionally, the teaching of construction materials includes a laboratory component, during which students are shown how these tests are conducted, and are allowed limited hands-on experience.

The challenge in teaching a construction materials laboratory is two-fold: (1) it can be difficult to find well-trained teaching assistants or laboratory technicians who are up-to-date on new procedures, due to the specialized nature of the subject and limited financial resources available, and (2) it is becoming increasingly difficult to maintain and re-invest in equipment and space for such laboratories. While many universities are willing to invest in research laboratories, researchers cannot afford the interruptions and challenges associated with letting inexperienced undergraduate and graduate students use their equipment. As a result, students are allowed limited time and access to be trained on and qualified to use the equipment. Most of the time required is to become familiar with equipment and procedures. That is mainly knowledge-level learning, a lower level, which could be shifted to be the learner's responsibility and out of the laboratory.

There are significant challenges faced by construction materials educators. In some programs, laboratory time continues to be significantly reduced and the teaching of advanced testing protocols is simply eliminated because of cost. In other programs, separate research and education laboratories consume valuable space and resources. In others, students are only taught the concepts of material testing in a lecture setting with no first-hand laboratory experience.

This paper describes the first phase of a project designed to restructure laboratory training and practice in engineering. The goal of this first phase is to integrate visual and auditory tools into teaching tools that detail standard test methods of construction materials. It describes the steps by which a set of videos and text were developed to offer engineering students an opportunity to visualize details of testing materials and assess their knowledge using the internet at a time they choose. The main objectives were to:

(a) standardize the quality of the teaching process, such that it becomes relatively independent of the level of knowledge or experience of the teaching assistants or instructor
(b) reduce the time required for the initial learning and focus more on the hands-on experience of students
(c) address learning biases of students and meet their new expectations.

Forming the Team

The project began as the initial team, consisting of two faculty and a graduate student, brainstormed new approaches to the course. The vision was based upon experiences the faulty had with several programs at the University of Wisconsin including the Creating a Collaborative Learning Environment Program (CCLE) and presentations within the University of Wisconsin Teaching Academy. Once the direction was established, the first steps were to videotape the testing procedures as conducted by experienced graduate students and convert the videotapes into a digital format to be placed on a web site. This was done during the first semester after the project started and was clearly disappointing. The lack of expertise in taping, the lack of a plan to convert the audio and visual components into a digital format, and the complexity of integrating the materials on a web site resulted in unsatisfactory progress for the project. The initial team discovered the challenges involved in developing the required materials and the need for a professional team.

With support from the University of Wisconsin College of Engineering, the team revised their objectives and expanded the approach. The initial team added an expert in informational media production, an expert in computer-based media technology to aid in instructional and assessment design, a web programmer, and two teaching assistants. The faculty shared the responsibility of administering the project and the checking of the technical information developed. The project team met regularly to assign roles and discuss problems. Because of the first-time nature of the project, the plan was revised and revisited as it was executed.

Generating the Educational Materials

It was essential to develop a methodology for developing material that used the talents of each of the team members efficiently and effectively. Source material was necessary from which the scripts for the individual labs could be generated. The scripts lay out the narrative of each lab exercise, with a video and audio column specifying the text / audio and the corresponding visual images for each step in the lab practice. (see example in Table 1). For the final videos embedded in the course web pages, the students would have the option of watching the video with text and/or an audio track. The amateur videos taped by the graduate students comprised one part of the source material. But the tapes were not complete. The producer and a professional videographer taped all of the labs with the students and a teaching assistant. These, plus the amateur tapes, provided a complete record of the lab activity during a semester and provided the source material from which the audio and video images could be planned and later recorded under more controlled circumstances.

This methodology, although time consuming, proved very efficient and played to the strengths of team members. The burden of initiating the audio/text part of the script was removed from the faculty members, who were already carrying full teaching and research loads. The media producer played a major role in developing the instructional content. With her experience writing scripts, she used the reference tapes as the source materials to generate the first narrative (video and audio) of the lab practice. The script was then distributed to the faculty members, the content experts and final controls for content and accuracy, for review. The teaching assistants, who conducted the labs, often reviewed the scripts as well.

An outline of each lab was developed, including the audio/text that would be spoken/seen plus a first description of the visual images that would be needed for the final presentation. After several iterations of the script, the lab exercises were planned and taped. These were done in special sessions with the teaching assistant, but without students. It was often necessary to tape a process several times and to shoot from different angles to show the process clearly and in detail in the final product. The media clips were then integrated as part of the web pages designed and organized by the web page expert.

The process of generating the media clips required a semester, including several revisions to capture the correct sequence of events and revise the text. Table 1 depicts an example of the narrative for one of the laboratory exercises. Each covers a complete laboratory exercise or a standard test within a laboratory exercise. Table 2 shows the list of eight laboratory sessions and the clips developed for them.

Table 1. Example of a Narrative Script for a Construction Materials Testing Lab

VIDEO	AUDIO
Safety Procedures: Stills to show protection in the lab	**Safety Procedures:** Wear closed shoes with a non-skid sole if you can. Your feet will likely get wet during this lab. Use a dust mask when pouring dry cement. You'll be touching concrete that can be hard on the skin. Be careful of hydration burns or allergic reactions to the concrete. It contains lime. Gloves are available for protection.
Purpose of Lab: Stills with text cover	**Purpose of Lab:** Gain hands on experience in mixing concrete; Learn to recognize mix attributes from visual examination of mix. Learn to conduct testing on fresh concrete and To produce specimens for subsequent testing of the mechanical properties of concrete.
Materials for Lab:	**Materials needed for Lab**: Portland cement Aggregates of different sizes Air Entrainment Agent Small scale/graduated cylinder Plastic buckets to weigh out mix constituents Plastic bucket of water to rinse tools Floor scale Large pan for mixing Shovels to mix Slump cone 2 Measuring rods 4 6"X12" plastic cylinder molds Trowels Wheelbarrow Air meters

Table 2. List of Laboratory Sessions Included on Web Page

1. Aggregates:
   - 1.1 * Specific Gravity Test/ Coarse
   - 1.2* Specific Gravity Test/ Fine
   - 1.3 * Coarse Aggregate Particle Test
   - * Fine Aggregate Angularity
   - * Rodded Unit Weight/ Coarse
   - * Sieve Analysis/ Coarse & Fine

2. Concrete: Mixing & Casting of Concrete
Preparation
Mixing 75 %
Slump Test 75 %
Mixing & Slump Test 100 %
Air Content
Cylinder Molds
Clean Up

3. Concrete: Elastic & Strength Properties of Concrete -7 Day Test
Preparation
Specimen Measurement
Rebound Hammer
Sonometer
Cylinder Capping
Tension Test
Compression Test

4. Asphalt: SUPERPAVE Binder Testing & Blending Aggregates for SUPERPAVE Mixtures
Blending Aggregate for SUPERPAVE Mixtures
Binder Introduction
Brookfield Rotational Viscometer
Rolling Thin Film Oven
Pressure Aging Vessel
Dynamic Shear Rheometer
Direct Tension Tester
Bending Beam Rheometer

5. HMA Mixing & Compacting
Preparation
Mixing HMA
Compacting HMA
Clean Up

6. Asphalt Mixture Density & Moisture Resistance

Bulk Specific Gravity Test Preparation
Bulk Specific Gravity Test
Indirect Tension Test Preparation
Indirect Tension Test
Theoretical Maximum Specific Gravity Test Preparation
Theoretical Maximum Specific Gravity Test

7. Iron & Steel
Tension & Hardness of Metals

Tension Test Preparation
Run Tension - Steel
Run Tension - Aluminum
Hardness Test Preparation
Run Hardness Tests

8. Testing Wood, Plastic & Composites in Bending
Beam Test Preparation
Run Beam Test
Creep Test Preparation
Gauges & Readings
Run Creep Tests
Compression Test Preparation
Run Tests

Web Page Design and Student Access

As many of us recognize, computer-based technologies are not yet mature in many areas. For example, it was clear from the beginning that converting raw recorded footage into web-based media included many options and required expertise. The options of conversion had consequences in terms of time required for loading and downloading the video clips and the compatibility with certain software and hardware requirements.

The questions that were raised included:

a. Would students need to view labs from their residence, which meant telephone modems for most students? This would make video clips difficult to download with sufficient visual detail due to time required and perhaps discourage students, who are used to short and quick internet activities, from viewing the videos.
b. Should students receive the video clips on CDs and thus, allow them to view videos on their own computers and then report back to instructors using the internet? How much control can we maintain over materials and timing if we give out CDs?
c. What software platform are we going to use? Some platforms allowed automatic grading, automatic recording of time and date of connection, statistical representations of trends, and allowed students to take quizzes and contact instructors. Others allowed only simple view and listen functions.
d. The appearance of the materials could have a significant effect on the student learning experience. Short video clips with audio and text shown simultaneously could be arranged. Is this the best? Or can we let students select which mode they would like to use? When is a moving clip more effective than a still picture and how does one choose which is best?
e. Maneuvering within the web page is important for students. Most would like to be in control so that they can browse, repeat, and move from one clip to the other quickly and smoothly. Is this simple to arrange? Or does it require specific software?
f. What are the assessment tools that we can use to test students knowledge and comprehension?

These questions are not unique to our team and, as many educators think about using computer-based learning, they will probably ask all these questions and more. From the discussions among the team members, a version of the web page design emerged. The version was a compromise among many different ideas, some biased toward technical content and others toward appearance and ease of integration into web design software. It was very difficult for all members of the team to reach the same level of knowledge in different areas and to explain the details to all. The important result was that all could be users of the web page and could find what they understood technically and acceptable. Having the teaching assistants as part of the team was important, because they brought in the student's (the learner's) perspective.

An example of one of the main web pages is shown in Figure 1. The title of the course and the overall content by topic are listed at the top. The details of each topic are listed in the column on the left. There were many debates about whether the web page should follow lectures chronologically or be based on course topics. The topic-based design was selected, as shown in the figure.

The lesson learned from the web page design is that not all the team members need to understand the details of web design software and that there are design options that can confuse the process and take time. It is best to have an experienced designer that narrows the options and takes a lead in making decisions. The web page design integrated lab and lecture materials, visual aids, previous exams, and other relevant information. It was a one-stop shopping design concept where students could find any information relevant to the topic, from a single page devoted to that topic.

Assessment Tools for Students' Learning

The team was very optimistic that the computer-based videos would help in creating a new learning environment that would reduce the time required for lower level learning and allow more time for advanced learning. It was, however, necessary to design the process to motivate students to take the responsibility for the knowledge-learning step. It was also important that we have a check of the learning progress of the students before they came into the lab.

Two ideas were discussed by the team: (1) to motivate students, a pre-lab quiz taken by students on the web could not only motivate students to watch the videos, but also could be graded automatically and used to assess a student's knowledge level. (2) A post-lab quiz on the web could give a final assessment of the advanced learning level.

Both ideas were implemented. The pre-lab quiz was justified so that students would come with some basic knowledge about procedures and equipment. No student was allowed in the lab if they had not taken the quiz which requires watching the media clips. While taking the quiz did not necessarily mean that students watched the video, the quizzes were designed such that it is very difficult to answer quiz without seeing the video clips. The quiz grade contributed to the course grade and the students were allowed to retake the quiz 2 times before lab. The questions in the pre-lab quiz were designed to focus on testing steps; mainly basic knowledge learning with minor comprehension learning.

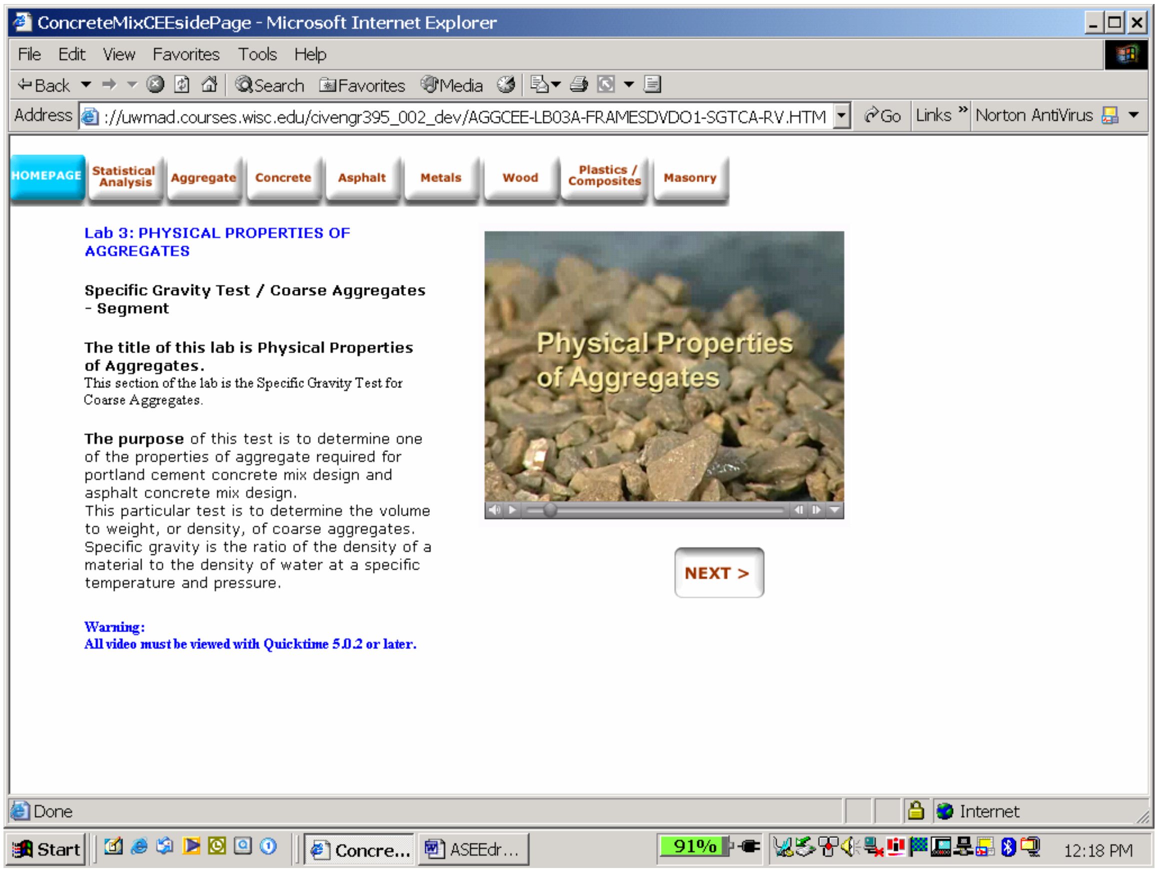

Figure 1. Example of a Web-page design Used in Web Site

The post-lab quiz was debated significantly among the team. Since the course work already included minor and major laboratory reports and 3 main evening exams, it was felt that assessment of higher level learning (comprehension and application) was already covered and thus post-lab quizzes should not duplicate this activity. The post-lab quizzes were, therefore, designed to be optional and to contain similar questions to the pre-lab with the motivation to improve quiz grades for those students that did not do well on the pre-lab quiz, or for those who would like to review the materials again or in greater detail. The highest grade of the pre- and the post-lab quiz was reported for the students.

The pre-lab quizzes were successful in the sense that students were motivated to view the videos and take the quiz. Needless to say, the main motivation was that this was mandatory. It is, however, important to note that the grade contribution was very limited and thus, it was apparent that students had some interest in taking responsibility for this level of learning. The teaching assistants noticed important changes in the flow of the labs and some significant reduction in time required to finish the labs. There was no question that we had standardized a major part of the information delivery process.

The post-lab quiz was not popular. Very few students attempted to take the post-lab quiz and the team recognized the need to re-evaluate the objectives of the post-lab quiz. One of the options considered for future development is to integrate lab reports and some of the exams into a post-lab exam that would focus on assessment of higher level learning. Also, integrating interactive questioning within the video segments to test application learning is being discussed among the team.

Many lessons were learned from the assessment activities of the design and implementation. At the beginning, there were many problems with compatibility of software generally available to students and versions required to effectively use the web page. This was resolved by giving detailed directions to download a newest version of the software. In addition, complaints were received about availability of computer time in campus computer labs. A connection speed faster than a 56K modem was required to play back some of the media clips. This prompted the idea that the videos be also placed on CDs and given to the students to be used on their own computers. Students were asked to pick up the CDs at no cost to them, but they had to sign an agreement to return the CDs at the final exam, so that older versions of the web page would not linger into the future. Out of 75 CDs made, only 5 students ultimately requested a copy. At the same time, the complaints about not finding enough campus computer time disappeared.

The other important lesson learned is that the transition from receiving the basic knowledge in the lab to the students taking the responsibility for this level of learning via the Web was very rapid and surprisingly free of complications. While students raised some complaints initially, the complaints were minor and stopped immediately after offering the CDs as an option. In addition, focusing the questions in the quizzes on basic knowledge learning, on information they can easily find by watching the video clips, made them understand the purpose and helped them accept the responsibility.

The difficult lesson learned from this activity was the amount of time required to prepare the quizzes, check them, get the right answers and integrate them into the web site. These tasks required significant time and coordination, particularly when this was done while the course was being taught. It is important to avoid underestimation of the time required and the sensitivity of the details of this task.

The Learners Feedback

The media expert within the team pointed out the importance of feedback and a student survey was designed and used to collect students' opinions about various aspects of the project. Table 3 shows four of the questions and the corresponding responses from students.

In question #1, it is important to note that the majority of students had a positive attitude towards the laboratory exercises. Almost 90 % of the students were neutral or confident that they could handle the labs without a problem. This attitude could explain the acceptance by this group of students of the responsibility for the basic learning process.

In question #2, it can also be seen that most students had some experience working in teams, as well as conducting individual laboratory experiments. In effect, this group of students had a positive attitude and prior experience with similar laboratory sessions. This could again explain the success in the transition that was observed.

In question #3, we can see the motivation to view the lab video clips was not only the grade points received. Approximately 60 % of the students indicated that they would have made use of the website sometimes (44%) and frequently (15%), while only 6% indicated that they would have never used the web site. There is no question that motivation is necessary for students to take the responsibility, but it is positive to see that more than 50% of the students voted positively for using the web-site. This vote could be considered a relative success in implementing the shift in the laboratory delivery process.

In question #4, it is seen that there could still be some problems related to the website access. Approximately 45% of the students have had some difficulty accessing the web site. This is an area which should be simple to resolve and is expected to fade away as computer software and hardware advances.

Concluding Remarks

The first phase of a project for developing a computer-based learning tool for construction materials was described in this paper. The goals were based on the understanding that Auditory and Visual learning modes are essential and achievable using computer tools. The benefits gained by integrating these tools, such as reduced time for laboratory sessions, standardization of the quality of the teaching process, and more effective use of hands-on learning time were realized in this project. These new tools offer an opportunity to better teach engineering principles and to make engineering classes more dynamic for students, regardless of their learning styles. The development of these tools requires significant time and resources. They also required a collection of expertise that was outside the civil engineering discipline and beyond what any one faculty could contribute. Although the initial project results appear positive, in the sense that classroom time can be shifted toward higher levels of learning and the acceptance by students of the basic learning tasks, assessing the true impact on total learning is a more difficult challenge that has yet to be completed. The key in assessment is to define very specifically the purpose of assessment. It is clear that time saving is being achieved, which would allow higher level learning. Convenience to the students and learning the technical content are the other two important aspects. Ideas such as evaluation of impact of simultaneous instruction of two groups of students using the computer based tool and conventional classroom setting is being considered. Also alternating the type of instruction and monitoring the impact on one group of students is another idea. Since the computer tool has just been developed, the team will be collecting more student feedback for another semester before deciding on the best type of assessment to be pursued.

In conclusion, it is important to recognize that we, as educators, are faced with new types of learners who have new expectations. Planning to accommodate the next generation of learners can only be successful if we start understanding their environment and be selective in the teaching tools we will use.

Table 3. Assessment Survey for Lab Tutorials and Demonstrations (5/9/2002)

***1. Think back to the time when you registered for this course. Were your* expectations for the lab component: (circle the one that best fits you)**

a. **44% -** Confident that I would readily handle the lab portion of the course
b. **45% -** Neutral, neither confident nor worried about the lab component
c. **10% -** Uncomfortable with the thought of the lab portion and what the expectations would be.
d. **2% -** Intimidated by the prospect of the laboratory sessions.

2. What type of background and experiences did you have that prepared you for hands-on lab work in CEE 395? (circle all that apply)

a. **60% -** used machines/tools in previous jobs
b. **74% -** conducted similar individual lab experiments in other courses
c. **68% -** participated in team lab projects in other courses
d. **45% -** grew up using tools and am comfortable around machinery
e. **8% -** Little or no previous experience

3. Would you have made use of the website if you didn't receive points for doing the pre-lab quizzes?
a. **2% -** Always
b. **15% -** Frequently
c. **44% -** Sometimes
d. **34% -** Rarely
e. **6% -** Never

4. Did you have difficulty accessing the website (for whatever reason) during the times most convenient for you
a. **3% -** Always
b. **8% -** Frequently
c. **35% -** Sometimes
d. **39% -** Rarely
e. **15% -** Never

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References

[1] Bandler, Richard, and John Grinder, Neurolinguistic Programming, Real People Press, 1979.
[2] Waldheim, George P., Understanding How Students Understand, Engineering Education, February 1987, pp. 306-308.

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