

Board Notes and Questioning: Two Time-Tested Techniques for Effective Teaching

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Abstract

The ExCEED (Excellence in Civil Engineering Education) Teaching Workshop is celebrating its seventh anniversary this year. So far, 171 schools have participated and this long running American Society of Civil Engineering program has produced 307 graduates. Last year, the United Engineering Foundation provided funding to expand the program to include electrical, chemical, and mechanical engineers. The ExCEED (Excellence in Engineering Education) workshops were jointly sponsored by ASCE, the American Society of Mechanical Engineers (ASME), the American Institute of Chemical Engineers (AIChE), and the Institute of Electrical and Electronics Engineers (IEEE). While the teaching workshop covers a variety of topics that include learning objectives, communication skills, and teaching with technology, the two topics that participants have consistently reported as most valuable are board notes and questioning techniques. Board notes provide a systematic means of organizing a class that helps ensure students will leave with good notes, lesson objectives will be met, the class will finish on time, disparate topics will be linked by transitions, physical demonstrations and group exercises will be appropriately placed, and the class will have a hierarchical structure that makes sense and is easy to follow. Questioning techniques provide the instructor with the tools to actively engage students in the learning process in a non-threatening way and encourages their participation during the classroom presentation. Questioning students by name causes significant angst for many professors, but it can reap huge benefits for the individual who is well prepared, understands how to ask questions, and is willing to take a small risk.

This paper will focus on these two concepts that provide the professor with the ability to manage the classroom space and time while engaging the students in the learning process. It will provide an explanation, the rationale and examples of both subjects. The concepts of board notes and questioning are merely two of the 13 seminars that the ExCEED workshop presents, but they are the two topics that are overwhelmingly cited as being most helpful in their development as teachers by over a half decade of participants.

I. Introduction

In response to the need to develop Civil Engineering faculty as effective teachers, the American Society of Civil Engineers developed the landmark faculty development initiative ExCEED (Excellence in Civil Engineering Education) which includes the ExCEED Teaching Workshop (ETW). The ETW is an intense, hands-on, high quality six-day workshop consisting of seminars, demonstrations, practice classes, critiques, and social events. Since 1999, there have been 13 workshops conducted on the campuses of the United States Military Academy,

University of Arkansas-Fayetteville, and Northern Arizona University. The program has 307 graduates from 171 different colleges and universities around the country. Last year, the United Engineering Foundation provided funding to expand the program to include electrical, chemical, and mechanical engineers. The ExCEEd (Excellence in Engineering Education) workshops were jointly sponsored by ASCE, the American Society of Mechanical Engineers (ASME), the American Institute of Chemical Engineers (AIChE), and the Institute of Electrical and Electronics Engineers (IEEE). Two workshops will be held in 2005 at West Point (July 24-29) and the University of Arkansas (July 10-15). Each workshop has 24 participants and the cost is heavily subsidized by the professional societies. A formal assessment survey is administered at the completion of the workshop and a follow-up survey is sent six months later after the participants have completed their first post-workshop semester of teaching. The feedback has been overwhelmingly positive where participants cite substantial improvements in their class organization, presentation skills, and rapport with students as a result of ETW.

The ETW is a highly intensive, hands-on, six-day workshop consisting of seminars, demonstration classes, and small group labs. The focus of the workshop is basic teaching skills and the goal is to improve teaching and learning in civil engineering programs. The ETW philosophy is to learn by doing. As such, most of the workshop consists of small group labs in which each attendee teaches and is critiqued on three separate practice classes. The workshop objectives are to teach and demonstrate the best methods of teaching and learning; have participants apply the best methods of teaching and learning in practice sessions; teach and demonstrate learning assessments skills; foster a passion for teaching; and build a learning community of civil engineering educators.

The workshop activities can be sub-classified into seminars, demonstration classes, laboratory exercises, and social events.

Seminars: The course schedule for the 2004 ETW contained 13 Seminars which varied in content and were designed to provide theoretical background, teaching hints, organizational structure, and communication techniques. A brief description of the seminars is offered in Table 1. The format for the seminars is lecture, small group activities, and collaborative discussion with an ExCEEd/ExcEEEd faculty member acting as presenter and moderator.

Demonstration Classes: ExCEEd/ExcEEEd faculty members teach sample engineering classes where the workshop participants are role-playing as students. The demonstration classes are intended to illustrate active engagement with students and reinforce the methods of teaching covered in the seminars in a realistic classroom environment. The demonstration classes are deliberately spaced at intervals throughout the workshops so that participants can better observe and appreciate different aspects of teaching as the workshop progresses. Afterward, student groups formally critique the strengths and weaknesses they observe in the demonstration classes.

Laboratory Exercises: Between a third and a half of the ETW is spent in small group laboratory assignments. A group consists of four workshop participants, a junior mentor (usually a recent graduate of a teaching workshop program) and a senior mentor (a veteran instructor with many years of successful teaching experience). Each student will teach three classes (25 minutes, 55 minutes, and 25 minutes, respectively) in his or her area of expertise while the other members of

the group role-play as students. Afterward, each class is critiqued. Initially the critiques are provided by the senior mentor, but as the workshop progresses, the fellow students provide the critiques. Ultimately, the participant who taught the class provides a self-assessment. Each participant receives a videotape containing all of his or her classes and critiques recorded for future reference.

Social Events: While much of the evening time is spent in class preparation, social events were deliberately planned to promote interaction, collaboration and the sharing of ideas. An introductory banquet, a Hudson River cruise, morning/afternoon snack breaks and lunches are designed as important learning activities.

While the laboratory exercises and the demonstration classes are consistently rated as the most valuable activities, there are two seminar topics that stand out in both the immediate and long term workshop critiques. Participants report that board notes and questioning techniques are the two most valuable tools that they incorporate into their teaching back at their own university. The purpose of this paper is to introduce the topics of board notes and questioning and hopefully explain why participants find them so worthwhile.

II. Board Notes

While the use of lesson objectives and a well organized outline certainly provides necessary structure to a class presentation, they do not provide enough detail to facilitate the delivery of classroom instruction. For this purpose, *board notes* provide a simple yet powerful tool. Board notes are accurate, handwritten representations of an entire classroom presentation. Board notes are created by subdividing a sheet of 8½" x 11" paper into four or six rectangular panels, each of which represents a segment of chalkboard approximately three feet wide. In general, each panel corresponds to one topic from the lesson outline.

Figure 1 shows one page of board notes for a Statics lesson on dry friction (Ressler *et.al.* 2004). The page represents exactly what the instructor intends to write on six boards during a classroom presentation. The size of each panel in the notes is calibrated to correspond to what that instructor can reasonably fit onto a board in the classroom. The instructor is therefore not fumbling to squeeze an inordinate amount of material onto a single board and does not have to inadvertently break a topic at an illogical point. The entire classroom presentation has been planned in advance, so the instructor can concentrate on explaining points clearly, engaging students, adding context, and answering questions.

Each board has a topic heading and only the critical information is included on the board. Wankat and Oreovicz (1993) note that, "Whatever is written on the blackboard is emphasized, and most students will attempt to copy the material. However, while doing this, they may miss what you are saying, so putting too much information on the board is counterproductive." The board notes show exactly what the students are expected to write in their notes. The instructor explains and amplifies the topic while writing these notes. Figures (such as free body diagrams) can be built one step at a time with the instructor explaining each element sequentially. Ideally, questioning (to be covered next) should be used to draw out responses from students that can be directly placed on the chalkboard as planned in the board notes. As Joseph Lowman (1995)

suggests, “When using the blackboard, the teacher should write concepts one at a time to stimulate student thought and memory, rather than putting them all up at once and then commenting about each individually.” Board notes reinforce this practice by prompting the instructor to identify discrete concepts and topics before, rather than during, the class.

Board notes have no specified format and should be modified to fit the needs of an individual teacher. Figure 2 shows sample board notes from several different classes (ETW 2004a). The sizes of the panels on the notes accommodate the preference and writing size of the person teaching the class. Some leave space for notes to the instructor to cue a class demonstration, an administrative announcement, an appropriate example or transition, a time check for pacing, an in-class exercise, a page in the textbook where the students should turn, or a question to be asked of a student – whatever an individual instructor finds beneficial. Most board notes are handwritten, but some instructors have found it beneficial to generate them on a computer. For those who appreciate the advantages of using several colors of chalk, the board notes can help facilitate a consistent color scheme by producing board notes with colored pins.

With practice, an instructor learns how long it takes on average to present a board of content. If it takes six or seven minutes per board, an instructor knows that 12 boards of material will not fit comfortably into a 50 minute class. An adjustment can be made in advance rather than addressing the problem as time runs short in the classroom. Board notes force the instructor to think through the entire class in advance which results in a clear, orderly presentation without any surprises or uncomfortable moments – the type of organization and lucidity we are trying to model for our students. If the class flows in a logical manner, there should be no need for an instructor to have to carry the board notes in his or her hands. They should be safely laid on a desk where they can be referenced, and if an instructor has rehearsed, memorization should not be necessary. Hopefully, the content of a board will flow naturally from the title of the board and the separate board titles will come logically from the transitions that tie the various topics together while the lesson objectives provide the overarching guide to the class.

Board notes are living documents and should be updated immediately after teaching a class to reflect how it can be taught better next time. The board notes become a record that makes teaching a class the following semester infinitely easier. If a new instructor has to teach a class or if a teaching assistant needs to cover a class while a professor is out of town, the board notes become a tremendous time-saving aid in preparation. Even the best set of board notes should be adjusted to meet the needs of a new instructor, but they offer a tremendous start. Board notes may take a little extra time at first, but they save considerable time and effort in the long run and lead to class presentations that are organized, logical, and easy to follow. While they were developed with the chalkboard in mind, the concept of one topic per board extends effectively into presentations using vu-graphs and Powerpoint slides.

III. Questioning Techniques

During the ExCEED/ExcEEd Teaching Workshops, no topic causes more angst, trepidation and resistance from participants than questioning techniques. The idea of calling on a student by name, asking a direct question, and waiting patiently for an answer is anathema to even many experienced teachers. Excuses for not asking questions include “it takes too much time and I’ll

never cover the material,” “my students will resent it and will give me bad teacher ratings,” and “my students would never play along.” Unfortunately, most teachers who question the value of questioning have never actually tried it. Others have made half-hearted attempts to teach interactively—but have quickly given up when their students were unresponsive or, worse yet, when students answered every question with “I don’t know.” Some instructors use questions in an adversarial way—to identify students who have not done their homework, for example—and then wonder why those same students react negatively to questioning.

The ETW suggests that *questioning is one of the most valuable tools in the teacher’s toolbox*. But like any tool, it needs to be used for an appropriate purpose; and like any tool, it must be learned before it can be used effectively. Effective questioning turns a passive classroom into an active learning environment in which the professor controls the course of events, but everyone is participating in the learning process. Effective questioning engages students in the subject matter, stimulates critical thinking, and adds variety to the student’s classroom experience. Done well, questioning can also be used as a vehicle to build positive rapport between the teacher and students.

Questioning isn’t easy. Good questions have to be thought through in advance and timed so they will have the greatest learning value. Good questions are short, clear and unambiguous—characteristics that usually can’t be achieved without considerable planning and forethought. There are several distinctly different types of questions, each of which is best suited for a particular circumstance or desired effect (Estes *et.al.* 2004).

The *default* question, is a standard technique and should be used most often. The instructor poses the question, pauses, and calls on a specific student. The pause forces all students to contemplate the answer, at least until a student is called upon to respond. Only then can everyone else relax—but only for a little while. The student’s name might occasionally precede the question if the same overzealous students keep providing the answers during the pause or if the student is clearly not paying attention and hearing his name called will cause him to hear the question. The instructor should make a concerted effort to ask every student at least one question in every class. Many professors avoid calling on students who have given no indication that they wish to answer, on the grounds that these students may be intimidated—and that interpersonal rapport in the classroom will be damaged as a result. Some students may be intimidated by direct questioning at first; but interpersonal rapport is greatly enhanced when all students in a class can be persuaded to participate fully in classroom discussions. The professor can best achieve this end by convincing students that he or she is asking questions to create an engaging, enjoyable learning environment, not to put them on the spot. Questioning in a positive, non-threatening manner is the key to creating such an environment.

The *volunteer* question requires the instructor to ask a question, pause, and wait for student to raise a hand. The technique is usually reserved for more conceptually challenging questions where every student is not expected to know the answer or where an interesting discussion might ensue. If there are no responses, the *jump ball* question is appropriate where the pause is followed by “anybody?” thereby inviting responses. This might be necessary after a series of *default* questions where the students are expecting a student name to be called. The *jump ball* question is also useful when the instructor is running out of time and needs to reach a certain

point to complete the lesson. The *jump ball* facilitates quick answers from whoever is able to provide them and allows the instructor to finish without totally disengaging from the class.

A good question is typically short, precise, clear, unambiguous, and nontrivial. Students will attempt to provide a correct answer, but sometimes the challenge is to read the professor's mind. The professor already knows the answer he wants to hear, but it is difficult to ask a question in a specific way so that the student understands what is wanted. Many questions are vague and might have a number of correct answers. Questioning is intended to stimulate critical thinking and engage the students, so most trivial questions serve little purpose. A somewhat trivial question can occasionally help build the confidence of a weaker student who might benefit from correctly answering a question. The *choir* question can be useful for trivial questions that reinforce a concept that has been emphasized in previous lessons and that everyone should readily know without hesitation. The technique is to ask the question, pause and say "everybody", whereupon the class responds in unison. An example might be, "what is the first step in every equilibrium problem...everybody?" and the class responds, "draw a free body diagram."

The ExCEED/ExcEEd seminars cover advanced questioning techniques such as the *misleading, expert, non-expert, blind, and misdirected* questions (ETW 2004b) that are used sparingly, but can be useful. Regardless of the type of question being asked, the most effective questions require prior thought. The board notes are an effective means of recording questions that will enhance a class. Hypothetical and what-if type questions can provide the linkages and transitions that make the various individual topics flow seamlessly. A well targeted series of questions will sometimes lead students to discover a concept for themselves without being explicitly told by the instructor, which is always a rewarding experience.

Questioning techniques are more difficult to implement in some situations such as the first lesson in a new topic where unfamiliar theory and new terminology is being introduced. Effective questioning is possible, but requires more thought and planning to connect prior knowledge or stimulate critical thinking towards the new topic being discussed. Other opportunities lend themselves easily to asking questions. If a class opens with a review of a prior lesson, the entire discourse can consist of instructor questions that urge students to recall the most salient topics previously covered. Solving an example problem offers an ideal chance to ask questions as students can provide equations, supply numbers for the equations, develop figures, and assess the reasonableness of an answer. Ideally, student responses to well-thought questions should be placed directly on the chalkboard as planned in the board notes.

The degree of positive rapport that is established through questioning will often depend on how the instructor responds to student answers. A professor needs to listen carefully to the student answer and respond as positively as the answer allows. Even if the answer is only partially right, a professor can use the correct portion to build on the concept being covered or formulate a follow-on question that will probe further. Questioning will be most effective in an open and friendly environment where students feel free to take a risk and are not made to feel ashamed when they answer incorrectly. Knowing student personalities becomes important as a response that may be well received by one student might easily offend another student. Obviously,

knowing student names is essential if an instructor is going to establish a dialogue and direct questions towards those students.

As a professor asks more questions, the students will also feel more inclined to ask questions and the tables are turned. It is now the professor who has to provide an answer. Like a good question, a good answer is also direct, efficient, accurate, clear, and positive. To do this, the instructor needs to listen carefully to the question. Otherwise, an instructor might be inclined to provide a long-winded detailed answer to a question that required a two or three word response. If the professor does not know the answer, he or she must be willing to declare that and attempt to find the answer prior to the next class period. A student question is often an opportunity to engage the class. Rather than answer every question directly, a professor may respond with a question in an attempt to get a student to answer her own question. The instructor may pose the question to the rest of the class to generate some thought prior to answering the question. In any event, all student questions should be addressed in some form.

Effective questioning requires practice and the willingness to take a risk. It might even require an explanation on the first day of class, so students understand why they are being asked questions. To ensure that classroom interaction is a positive experience for students, the instructor must praise correct answers, be supportive with wrong answers, encourage participation from everyone, and create a classroom atmosphere that is threat-free—and maybe even fun. Despite initial reluctance, students will grow to appreciate the questions as a sign that the professor cares about their learning and wants to involve them in the process.

VI. Conclusions

The ExCEED/ExcEEd Teaching Workshops provide an intense one-week total immersion into the art of teaching. The long and short term survey results from the hundreds of participants who have attended over the past seven years indicate that the experience is beneficial and extremely valuable. While the topics covered are all well received, the areas that have been consistently reported as the most useful were board notes from the Organizing a Class seminar and questioning techniques from the Communication Skills seminar.

Board notes provide an organizational tool that requires an instructor to consider every aspect of a classroom presentation and plan all written work on the board out in advance. In many ways board notes represent the script in a play where the writing on the board represents the actor's dialogue and the notes to the side are the stage direction. Effective questioning techniques engage the students and make them characters in that play. They are no longer passive observers but are part of the action. Combining both board notes and questioning helps ensure that classroom presentations are organized, logical, engaging, and compelling. More importantly, the students are probably learning as a result.

Acknowledgments

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ExCEED/ExcEEd Teaching Workshop Seminars	
I	Learning to Teach: Justifies importance of formally learning to teach and introduces a model instructional strategy that will be a road map for the ETW
II	Principles of Effective Teaching and Learning: Introduces Lowman's (1995) two-dimensional model of teaching and provides a compendium of learning principles
III	Introduction to Learning Styles: Examines Felder's (1993) Learning Style Dimensions and examines how to accommodate all styles of learners
IV	Organizing a Class I -- Learning Objectives: Introduces Bloom's (1956) taxonomy of educational objectives and shows how to write appropriate and useful learning objectives
V	Organizing a Class II -- Planning a Class: Offers a structured methodology for organizing a class with emphasis on constructing an outline, board notes, and out-of-class activities
VI	Instructional Technology I – The Chalkboard: Covers fundamentals of communication skills and making written presentations using the chalk board, vu-graphs, and Powerpoint slides
VII	Teaching Assessment: Introduces techniques such as muddiest point paper, preconception check, minute paper, and approximate analogy as potential means of assessing student comprehension (Angelo and Cross, 1993)
VIII	Communication Skills -- Speaking and Writing: Covers fundamentals of communication skills with emphasis on speaking to a group and making classroom presentations
IX	Communication Skills -- Questioning: Examines different student questioning techniques and discusses effective strategies for their use
X	Teaching with Technology: Focuses on effectively incorporating the computer and various types of software into classroom instruction
XI	Systematic Design of Instruction: Introduces a model for designing a course in an established curriculum and examines the role of classroom teaching in that model
XII	Non-Verbal Communication in Instruction: Explains how instructors and students communicate through non-verbal cues such as body position, facial expressions, gestures and eye contact
XIII	Developing Interpersonal Rapport: Offers useful techniques for building an effective rapport with students; discusses student personality types and offers hints to avoid chill in the classroom

Table 1. Content of the ExCEED/ExcEEd Teaching Workshop Seminars

DRY FRICTION

IMPENDING MOTION

RDC

• OPPOSES MOTION
• TANGENT TO SURFACE OF CONTACT
• $f(N, \text{SURFACE})$

UNKNOWN
NOT ALWAYS THROUGH THE CENTER OF MASS

IMPENDING TIP

• N ON EDGE OF BODY AT TIP
• F_f IN "NO SLIP ZONE"
 $< F_{MAX} = \mu_s N$

IMPENDING SLIP

$F_f = F_{MAX} = \mu_s N$
 $F_f = \mu_k N$

NO SLIP | SLIP

• $F_f = F_{MAX} = \mu_s N$ AT SLIP
• N ACTS ON THE BODY

STUDY GUIDE PROBLEM #1

1. READ THE PROBLEM

GIVEN:

$W = 300 \text{ LBF}$
 $\mu_s = 0.3, \mu_k = 0.2$

FIND: THE NORMAL AND FRICTIONAL FORCES. CONSIDER SLIPPING AND TIPPING.

2. DRAW DIAGRAMS

FBD

• NON-CONCURRENT FORCE SYSTEM
• 3 EQUATIONS
• 3 UNICQUONS (N, F_f, d)

3. APPLY PRINCIPLES

$\sum F_{\perp} = 0$

$$-P(\sin 20^\circ) - 300(\cos 20^\circ) + N = 0$$

$$N = 330 \text{ LBF} \uparrow 70^\circ \text{ ANS}$$

$\sum F_{\parallel} = 0$

$$P(\cos 20^\circ) - 300(\sin 20^\circ) - F_f = 0$$


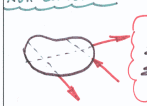

$$F_f = 28.9 \text{ LBF} \leftarrow 20^\circ \text{ ANS}$$


$\sum M_G = 0$

$$-F_f(1) + N(d) - 140(\cos 20^\circ)(1) + 140(\sin 20^\circ)(1.5) = 0$$

$$d = 0.27' \text{ ANS}$$

Figure 1. A sample page of board notes for a class on dry friction (Ressler et al. 2004).

Term: 04-2 Lesson: 5-9 Subject: Trusses I 1/3	
<p>OBJECTIVES</p> <ul style="list-style-type: none"> Define "truss." List & explain the assumptions necessary for truss analysis Calculate internal forces in truss members using: <ul style="list-style-type: none"> Method of Joints Method of Sections <p>Music Intro: Bob - 3:10 Mambo #5 - 6:30</p>	<p>REVIEW: Force Systems</p> <p><u>Concurrent</u></p>  <p>$\sum F_x = 0$ $\sum F_y = 0$</p> <p><u>Non-Concurrent</u></p>  <p>$\sum F_x = 0$ $\sum F_y = 0$ $\sum M_{ANY PT.} = 0$</p>
<p>TRUSSES</p> <p><u>Definition</u> (p.257)</p> <p><u>Examples:</u></p> <p>Bridges Roof Structures Towers</p> <p>Long Spans, Light Weight</p> <p>• Show ppt slides • K'nox bridge demo • Transition: Objectives</p>	<p>Assumptions for Analysis</p> <p>* Loads applied @ joints } p.259 * Joints are smooth pins</p>  <p>Realistic?</p> <p>• Wooden truss demo • Add diagonal after demo • Only if asked</p>

COURSE: EM302 HANUS, AY 01-1	
LSN: S-9, TRUSS ANALYSIS I PAGE 2 OF 4	
<p>00 REVIEW: 2-FORCE MEMBERS 14</p>  <p>• Member with force application at two frictionless pins only (neglect wt).</p> <p>• Equilibrium requires EQUAL, OPPOSITE, and COLLINEAR forces (compression or tension).</p> <p>• Shape is NOT a factor.</p>	<p>TRUSSES 3</p> <p>Def: Structure composed of slender members joined together at their end points.</p> <p><u>Characteristics (Why):</u></p> <ul style="list-style-type: none"> High loads vs. low structural weight High strength vs. long spans Straight slender members <p>NOTES N</p> <p>Examples</p> <ul style="list-style-type: none"> Simple truss example (DEMO/MODEL) Bridge (MODEL) Roof (MODEL) Space (MODEL) Square vs. triangle (DEMO)
<p>TRUSSES 4</p> <p>Assumptions:</p> <ol style="list-style-type: none"> Loading at joints only, Connected by frictionless pins, Member weight negligible <p>Trusses are composed of 2-Force Members!</p>	<p>NOTES N</p> <p>from reading, SS 6.1, pg. 259</p> <p><u>Idealized Real World</u></p> <ul style="list-style-type: none"> show bridge deck (MODEL) show gusset plate - CONCURRENT! (M) (6) neglect wt? < forces or apply 1/2 weight at each joint. <p>(C) or (T), why important? BUCKLING DEMO (7)</p>

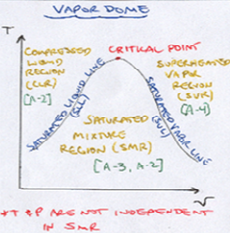
<p>MES01 BOARD NOTES</p> <p><u>SIMPLE COMPRESSIBLE SYSTEM</u></p> <p>PURE SUBSTANCE (USUALLY IN A CLOSED SYSTEM) WHOSE ONLY WORK IS BOUNDARY WORK</p> <p><u>STATE PRINCIPLE</u></p> <p>THE STATE OF A SIMPLE COMPRESSIBLE SYSTEM CAN BE FIXED BY TWO INDEPENDENT, INTENSIVE PROPERTIES</p> <p><u>EXAMPLES</u></p> <p>P & M T & h P & T → ONLY IF SINGLE PHASE</p>	<p><u>STEAM TABLES</u> [A-2, A-3, A-4]</p> <p>RELATE TEMPERATURE & PRESSURE FOR STEAM (LIQUID & VAPOR)</p> <p><u>SATURATION QUANTITIES</u></p> <p>POINT AT WHICH PHASE CHANGE MAY OCCUR</p> <p>[TBL A-2] GIVEN Temp = T_{sat} → P_{sat} = P_{sat} = 1.014 bar = 101.4 kPa</p> <p>[TBL A-3] GIVEN Press = P → T_{sat} = T_{sat} = 99.61°C</p> <p>H₂O BOILING POINT → T AND P DEPENDENT</p>	<p>LESSON: 13 page: 3</p> <p><u>VAPOR DOME</u></p>  <p>• T & P ARE NOT INDEPENDENT IN S.M.R.</p>
<p>- BOILING CURVE IN OTHER (TAKES LONGER TO LOOK)</p> <p>- PRESSURE CHANGE ↑ P GREATER ENERGY TRANSFER</p> <p>• VACUUM BOILING DEMO</p>	<p>- DEW POINT & DEW</p>	<p>Notes</p>

Figure 2. Sample pages of board notes from different instructors (ETW 2004a).