AC 2009-753: PAST, PRESENT, AND FUTURE (PPF) SHEETS FOR IMPROVED COMMUNICATION OF LESSON OBJECTIVES AND EXPECTATIONS

Tanya Kunberger, Florida Gulf Coast University

Past, Present, and Future (PPF) Sheets for Improved Communication of Lesson Objectives and Expectations

Abstract

Some of the major challenges facing new faculty in the area of instruction deal with how to communicate the objectives and expectations of a particular course to the students in the best possible manner. Questions related to students' focus on key points of each particular lecture, increasing student engagement in the classroom, and how to reduce potential conflicts and confusion surrounding assignment due dates and classroom activities are often of primary concern. Many of these items can be addressed with the development of Past, Present, and Future (PPF) sheets for the course.

PPF sheets contain information regarding *past* topics relevant to the current class, *present* deliverables, learning objectives, and discussion questions, and *future* deliverables as well as discussion questions for the next class. The sheets are designed to provide a one-stop source for a majority of the important information for the course. Homework assignments are presented in these sheets, due dates for homework, lab reports, and projects are listed, and reminders for tests and other important items are listed. Discussion questions are listed for both the current and subsequent class with the expectation that this will facilitate a higher level of class interaction. Learning objectives for the current class are listed and form the basis for expected student abilities – these objectives also provide an excellent source for testing review.

PPF sheets have been employed in various classes from sophomore through senior level. Students have been asked to evaluate the benefit of these sheets and results indicate a positive response from most individuals. From an instructor perspective, the amount of time spent discussing course scheduling is dramatically reduced – allowing that time to be channeled to coverage of course topics. The inclusion of learning objectives improves student focus and the discussion questions increase student participation by giving them an idea of "what to expect" from the instructor.

Introduction

New faculty often face a number of challenges in the classroom when it comes to creating a successful course. Virtually all have the technical expertise to conduct the course, the difficulties arise in communicating that knowledge, and the associated expectations, to the students. In her 2008 paper, Helterbran notes that "Students are especially aware when their professors appear to be on top of things in the classroom. Elements of organization and the ability to teach in a seamless fashion are important to students." The concept of a high level of organization, presented in a timely manner, is nothing new. A number of studies[2-5] have been conducted that support the use of advance organizers in the classroom. "An advance organizer is information that is presented prior to learning and that can be used by the learner to organize and interpret new incoming information.[5]" This idea of providing students with information prior to class, connecting previously covered information to the current lesson, and clearly establishing

expectations with regards to student submissions, required levels of knowledge on each topic, and potential discussion areas for each lesson was the inspiration behind the development of Past, Present, and Future (PPF) sheets.

The PPF sheets also address three of the "Seven Principles for Good Practice in Undergraduate Education" presented by Chickering and Gamson[6-7]. The sheets encourage active learning by relating current topics to past experience and providing discussion topics that encourage students to talk about what they are learning. They emphasize time on task by establishing level of required / recommended competence for each objective utilizing Bloom's taxonomy[8], and they communicate high expectations by providing the means for students to come to class prepared for discussion, not lecture, so that they can contribute in a meaningful fashion to the learning process.

Design

Past, Present, and Future sheets are laid out in three main sections. The past section focuses on previous topics that relate to the current lecture. The present section contains the daily lesson objectives, a list of current deliverables, and discussion questions for the lesson. Newly assigned and upcoming deliverables, as well as next class's discussion questions are provided in the future section. Additional details about the rationale for each section, as well as the included components are discussed below. An example PPF can be found at the end of this paper.

Past

The past section is the briefest of the three. The main point of this section is to relate the new topics that are to be introduced in the current lesson to topics to which the students have been exposed previously. These topics may be ones that they have encountered in previous courses, or simply topics from earlier lessons in the current course. Either way it provides a basic expectation level as a starting point for the current lesson. For the first PPF of the course, course pre-requisites are also included in this section.

Present

The present section includes three main components: deliverables, learning objectives, and discussion questions.

Deliverables

In the present section, the deliverables category lists any items that are expected to be submitted on that day. Handouts or other items that students need to bring to be used in class that day are also listed in this section.

Learning Objectives

Whether "calculate" or "identify", "explain" or "integrate", individual lecture objectives provide students not only with the general topics the lesson will focus upon, but also the level of understanding they are expected to achieve. For some of the topics (or portions of a topic) in a course, it is only necessary to reach the comprehend level of the cognitive domain as defined by

Bloom's Taxonomy[8]. An example of this would be to explain the steps associated with the construction of a consolidation curve in a soil mechanics course. In contrast to this lower level, a mid level learning objective could be "compare various triaxial test methods and the advantages associated with each," which falls into the analyze level of the cognitive domain. Higher level thought on both of these topics might be addressed with learning objectives in the evaluate category. For example "correlate results from a consolidation curve with available field data to assess the expected settlement at a given site" and "recommend a triaxial test for a given project." Regardless of expected domain level, clearly stated and readily available class learning objectives provide the students with these expectation levels and allow them to tailor their studying accordingly.

Contained in the present section, lesson learning objectives are presented at the beginning of class and periodically referenced throughout lecture. Often times they are also referenced in subsequent lectures in order to relate new material to previous topics. While the presenting and referencing can be accomplished without the aid of the PPF sheets, these sheets provide the students with the objectives prior to class attendance and serve as a permanent reference which the students can access at any time. Additionally, a written version of these objectives in conjunction with the verbal presentation touches on both the verbal and visual learning styles from the Felder – Silverman Learning Style Method[9].

Discussion Questions

The discussion questions expand upon the learning objectives. Questions relevant to the current class are contained in the present section, while those for the next class are presented in the future section. Touching upon common misconceptions, as well as the building blocks to the larger class objectives, the discussion questions are the smaller points that students often misunderstand or may fail to connect to the big picture. Often times these questions can be asked during the class, and serve as starting points for group discussions or in class activities. The idea of providing them prior to class serves two purposes. First, students have the ability to make their own connections and / or pursue their own ideas. Second, it provides students with an idea of what to expect in class.

The concept of an interactive classroom is the involvement of students in the learning process. One of the key components of this involvement is a greater interplay between student and professor, possibly through question and answers. The American Society of Civil Engineer's (ASCE's) Excellence in Civil Engineering Education (ExCEEd) Teaching Workshop[10-11] encourages the use of more direct questioning techniques. Rather than asking a general question to the entire classroom, the instructor instead asks a question, pauses, and identifies an individual for a response. This method increases student culpability, improves student alertness, and engages a greater proportion of the student classroom population. While the author understands these benefits, she has always been somewhat hesitant in employing the method in practice, having been a student who rarely volunteered in class but rather preferred to be as unobtrusive as possible in the classroom – and was always a little fearful in classes where direct questioning was employed. Providing the questions to the students prior to class is, in the author's opinion, a compromise. Students have a better idea of what to expect in class, which should result in a reduction of any student fears. Also, since all students have access to the questions, if the individual asked does not have the answer, oftentimes a friend at the table can assist in responding to the inquiry.

Future

Deliverables and Discussion Questions categories can also be found in the future section of the PPF. The discussion questions section is provided so that students have an idea of what questions and topics will be touched upon in the next lesson. The deliverables category in the future section contains new assignments, which are listed initially on the day of assignment, and remain in the future deliverables section until the due date. Upcoming tests, labs, or homework sets are also included in this section. Items are listed both by due date as well as by the time between now and that date. A new homework assignment given on February 2nd for example would look like "1 week (9 February) Homework problems 8.2, 8.3, 8.7, & 8.9" when initially presented and evolve to "Next class (9 February) Homework problems 8.2, 8.3, 8.7, & 8.9" on the next PPF, before being transferred to the current deliverables category in the present section on the following PPF.

Notes (such as no class next week – spring break) are also included in the future section and remind students of items that affect the typical class routine.

Use of Color

Color is used throughout the PPF to highlight various sections. Current deliverables are in bright red, while future deliverables are in a darker red. Learning objectives are in blue (action verb) and green (bulk of objective). Present discussion questions are in black, and future ones are in grey. Special notes are in purple. Although color is not necessary, it livens up the pages, and is particularly nice for highlighting the action verbs in the learning objectives (blue and green were chosen because they are the school colors). Some students choose to print in color, while others print only in black and white. Color versions of all PPFs are provided on the course webpage.

Application

The author first developed PPF sheets for use in her soil mechanics course in the spring of 2008. Since then she has used them for courses in Fluid Mechanics, Engineering Mechanics, and Geotechnical Engineering. Colleagues have adapted the practice for courses in Environmental and Bioengineering as well. The courses where they have been introduced by the author range from first semester sophomore year through second semester senior year and range in size from 14 – 53 students (which is the maximum class size for engineering courses at the university). For a majority of the courses, PPFs were established on a daily basis. The one deviation is the Geotechnical Engineering course. As a senior level design course, many of the topics covered span more than a single day. Rather than creating a series of smaller fairly short PPFs, the author decided to create a PPF that was topic, not lesson specific. This translates to roughly one PPF for every 2 or 3 lessons (one every week to week and a half). The general design is the same, although in the present deliverables section dates have been added since due dates may not correlate to the first introduction of the PPF and in the future deliverables section assigned and due dates are presented to make students aware that the assignment may not correlate with the first day to which the PPF applies. All PPF sheets are available electronically from the course website.

Results

Results from implementation of the PPF sheets in various courses have been almost overwhelmingly positive, both from an unofficial, as well as a more systematic approach. Survey questions addressing PPF sheets were added to the student assessment of instruction form that students complete anonymously at the end of the course for both Soil Mechanics in the spring of 2008 and Engineering Mechanics in the fall of 2008. Table 1 lists the questions asked and summarizes the results from these surveys. Response rates from the two courses were 89% and 92%, respectively.

Table 1: Summary of PPF survey questions and positive responses for two courses

Question	Soil Mechanics (18 students)		Engineering Mechanics (53 students)	
	% Strongly Agree or Agree	% Strongly Agree	% Strongly Agree or Agree	% Strongly Agree
The PPF sheets increased my understanding of the course **objectives**	86	43	76	55
The PPF sheets increased my understanding of the course **topics**	93	50	74	54
The PPF sheets increased my understanding of the course **expectations**	93	64	81	68
I would like to see PPF sheets in future courses	93	72	77	66

Results from these classes show that the majority of students agree or strongly agree with the belief that the PPF sheets increased understanding of course objectives, topics, and expectations, with most of these responses tending towards the strongly agree option. Responses for each class are highest in the expectations category – something unsurprising based on the items included in the sheets themselves (specifically the deliverables section). As well as considering the positive responses, neutral and negative responses were also evaluated. Table 2 summarizes those responses to the same questions from the same courses. The same response rates apply from above.

Table 2: Summary of PPF questions and neutral and negative responses for two courses

Question	Soil Mechanics (18 students)			Engineering Mechanics (53 students)		
	% Neutral	% Disagree	% Strongly Disagree	% Neutral	% Disagree	% Strongly Disagree
The PPF sheets increased my understanding of the course **objectives**	14	0	0	11	4	9
The PPF sheets increased my understanding of the course **topics**	0	7	0	13	7	7
The PPF sheets increased my understanding of the course **expectations**	7	0	0	9	5	5
I would like to see PPF sheets in future courses	7	0	0	14	4	5

With regards to the Soil Mechanics course, students not in the agree or strongly agree categories were predominantly in the neutral category. No students fell into the strongly disagree category in that course. When considering the Engineering Mechanics course, students were more evenly split between the neutral and disagree / strongly disagree categories. No category had more than 15% of the students disagree / strongly disagree with any of the statements. Based on the provided comments, discussed more fully in the next section, as well as the survey responses presented here, the author believes that the sheets are a beneficial addition to the course(s).

A second implementation of the sheets in Soil Mechanics and Engineering Mechanics (under a different instructor) and an initial offering in Geotechnical Engineering are currently in progress so no final assessment data is available. Due to timing, the author neglected to collect data from the Fluid Mechanics courses. The data presented above includes only students that have seen the PPF sheets for the first time in a course. Students enrolled in Soil Mechanics this semester were exposed to the sheets in Fluid Mechanics last semester (same sheets with two separate instructors); while those in the Geotechnical Engineering course were the cohort from the first Soil Mechanics course. Students from the Engineering Mechanics course above have the potential to be exposed to PPF sheets in another 2 – 3 courses over their tenure at the university.

Informal Instructor Evaluation / Student Comments

In addition to the more structured surveys, the author has also witnessed or engaged in conversations with students regarding PPF sheets. The following is anecdotal evidence supporting the use of these sheets.

The first hint the instructor had that these might be valuable occurred on the first day of the Soil Mechanics course in spring 2008. The author had posted PPF sheets for the first 8 lessons (those up until the first test) on the course website but also had printed out copies of the first PPF to distribute on day one. Even prior to distribution, students were commenting on the sheets, and a number of them had already printed them out and brought them to class – even though no request had been made by the instructor to this effect. Some of the students who had undertaken this initiative were those that the author had not anticipated – having had the group of students in a previous class. Many asked if there were going to be sheets like this for the entire course, or only the ones currently posted. This cohort of students is now in the Geotechnical Engineering course, and asked on the first day if PPF sheets were going to be provided for the class.

Students from the Engineering Mechanics course in the fall of 2008 have stopped by the author's office in the spring of 2009 to comment on how much they miss the PPF sheets from that course and have asked if the author offers PPFs for all courses she teaches.

When asked why they like the sheets the most common response is that it "helps keep me organized" or "I always know what to expect / what's going on" with the course. Many mention liking the color associated with certain areas, the continuity of where to find information, and the fact that the deliverables "countdown" from initial assignment until the final due date.

Students have come to the instructor before a test with a list of the discussion questions and their answers with the intention of clarifying specifics for some of the questions. This is particularly useful for the theoretical portions of the courses, as students often find it more difficult to determine what an instructor feels is important in the concepts than what is required for calculations.

Some students have mentioned that they find it cumbersome to have to access the sheets to determine what the homework has been assigned. While reminders are mentioned in class about homework being due, specific homework problems are not mentioned in the class – thus the students must access the PPFs (or the calendar in some classes) to determine this assignment. Others mention assignments are the only reason they use the sheets. These comments are less common than the positive ones, although the author does not necessarily see them as negative. The choice not to take full advantage of the resources is a decision each individual must make and does not detract from the inherent value of the resource itself.

Summary and Conclusions

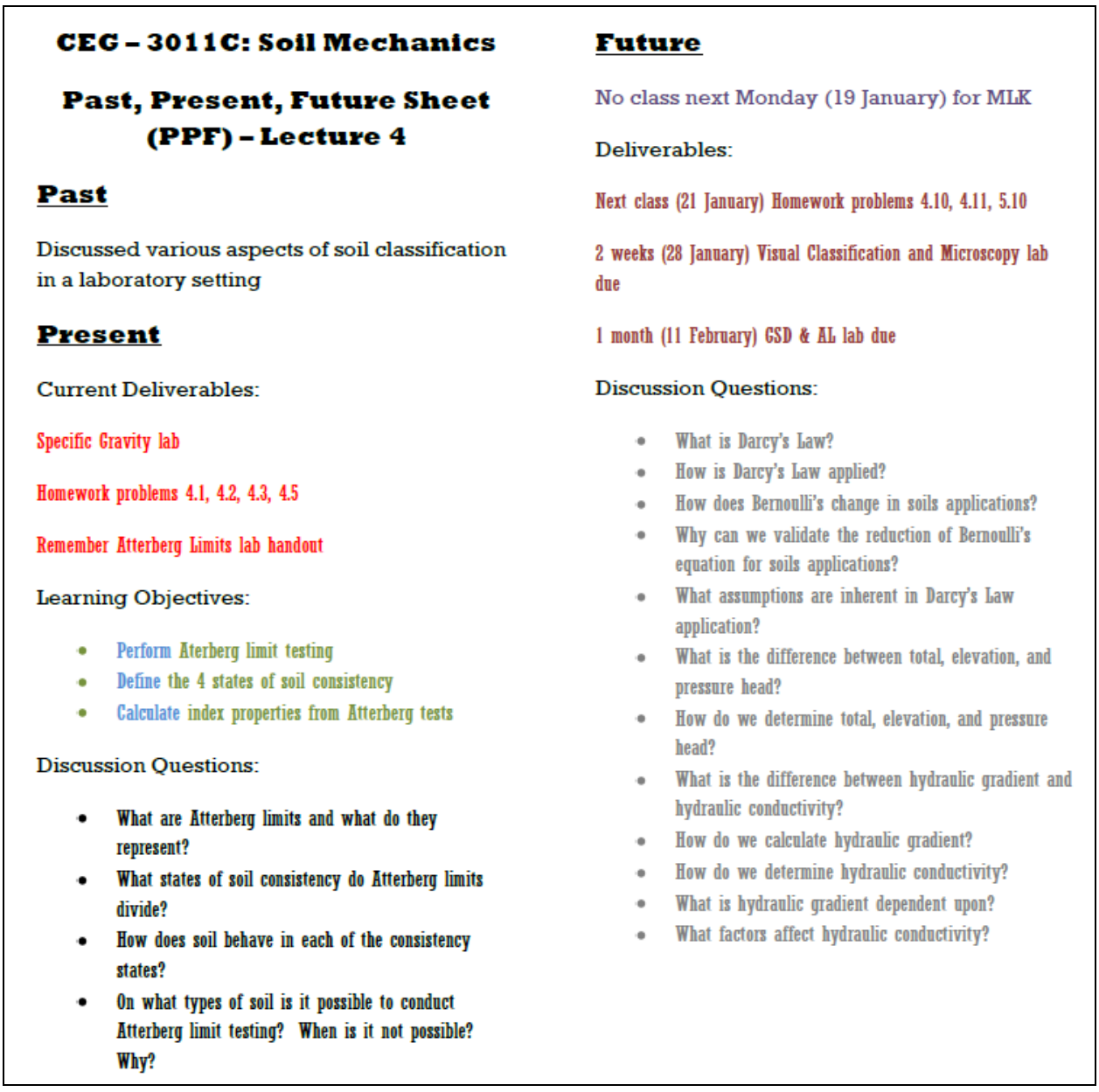
In summary, Past Present and Future sheets are a way of presenting a large amount of course information in a relatively concise location. Containing assignments, lesson objectives, and discussion questions, they assist in linking past topics with current applications and also look at the horizon for future topics and expectations. Results from formal and informal evaluation measures indicate a positive response from students to the implementation of PPF sheets in courses ranging from sophomore to senior level and class sizes from small (~15) to mid size (~50 representing the largest engineering courses at this university).

Future evaluation is planned with regards to different students in the same course as well as following cohorts through different courses to determine if 1) a larger number of students will find the use of PPFs valuable to their learning, 2) if students find PPFs valuable to their learning

in various courses and 3) if PPFs can be as valuable on a weekly (or more) basis as on a lesson by lesson basis.

Example PPF Sheet

The PPF sheet shown in Figure 1 is one from the author's spring 2009 Soil Mechanics course. This particular PPF is from Lecture 4 and was chosen because it illustrates both the typical sections, as well as the special notes section. The length of each section and category varies from sheet to sheet, this one has relatively short learning objectives and discussion questions because the lesson contains a lab designed to occupy more than half of the class time.



CEG – 3011C: Soil Mechanics

Past, Present, Future Sheet (PPF) – Lecture 4

Past

Discussed various aspects of soil classification in a laboratory setting

Present

Current Deliverables:

Specific Gravity lab

Homework problems 4.1, 4.2, 4.3, 4.5

Remember Atterberg Limits lab handout

Learning Objectives:

- Perform Aterberg limit testing
- Define the 4 states of soil consistency
- Calculate index properties from Atterberg tests

Discussion Questions:

- What are Atterberg limits and what do they represent?
- What states of soil consistency do Atterberg limits divide?
- How does soil behave in each of the consistency states?
- On what types of soil is it possible to conduct Atterberg limit testing? When is it not possible? Why?

Future

No class next Monday (19 January) for MLK

Deliverables:

Next class (21 January) Homework problems 4.10, 4.11, 5.10

2 weeks (28 January) Visual Classification and Microscopy lab due

1 month (11 February) GSD & AL lab due

Discussion Questions:

- What is Darcy's Law?
- How is Darcy's Law applied?
- How does Bernoulli's change in soils applications?
- Why can we validate the reduction of Bernoulli's equation for soils applications?
- What assumptions are inherent in Darcy's Law application?
- What is the difference between total, elevation, and pressure head?
- How do we determine total, elevation, and pressure head?
- What is the difference between hydraulic gradient and hydraulic conductivity?
- How do we calculate hydraulic gradient?
- How do we determine hydraulic conductivity?
- What is hydraulic gradient dependent upon?
- What factors affect hydraulic conductivity?

Figure 1: Example PPF Sheet

References

1. Helterbran, Valeri R., "The Ideal Professor: Student Perceptions of Effective Instructor Practices, Attitudes, and Skills," Education, 129 (1), p 125 – 138, 2008.
2. Ausubel, D. P., "The use of advance organizers in the learning and retention of meaningful verbal material," *Journal of Educational Psychology*, 51, p 267-272, 1960.
3. Ausubel, D., "In defense of advance organizers: A reply to the critics," Review of *Educational Research*, 48, 251-257, 1978.
4. Stone, C. L., "A meta-analysis of advanced organizer studies," *Journal of Experimental Education,* 51(7), 194-199, 1983.
5. Mayer, R. Learning and Instruction, New Jersey, Pearson Education, Inc., 2003.
6. Chickering, A.W. and Z.F. Gamson, "Seven Principles for Good Practice in Undergraduate Education," *AAHE Bulletin*, March, 1987.
7. Chickering and Gamson, "Development and Adaptations of the Seven Principles for Good Practice in Undergraduate Education," *New Directions for Teaching and Learning*, 80, p75 – 81, 1999.
8. Anderson, L.W. and Others, A Taxonomy for Learning, Teaching and Assessing: A Revision of Bloom's Taxonomy of Educational Objectives, Addison Wesley Longman, Inc., 2001.
9. Felder, R., "Matters of Style," *ASEE Prism*, 6 (4), p 18 – 23, December, 1996.
10. Lenox, Thomas, Stephen Ressler, Ronald Welch, Allen Estes, Carol Considine, Norman Dennis, Jim O'Brien, Debra Larson, and Tonya Nilsson, "ExCEEd Teaching Workshop: Tenth Year Anniversary," *2008 ASEE Annual Conference and Exposition*, 2008.
11. Ressler, Stephen and Allen Estes, "ExCEEd Teaching Workshop: Fulfilling a Critical Need," *2001 ASEE Annual Conference*, 2001.