

From the Battlefield to the Classroom: Bringing Leadership as a Civil Engineer in Iraq into the Classroom

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Introduction

In May 2003, I had just relinquished the guidon, the symbol of command authority and responsibility for a 130 soldier combat heavy construction company, in Iraq. I was preparing to make a huge transition in my life and career. I was leaving the dust, heat and eternal threat of violence in post-war Iraq to teach civil engineering at the Nation's First Department of Engineering at the United States Military Academy at West Point, New York.

West Point's mission is "to educate, train, and inspire" cadets to become leaders of character in the U.S. Army. The students here are unique in that they know their first job will be leading soldiers as a second lieutenant in the Army. Following graduation and commissioning, new lieutenants attend school for their branch, and then they arrive at their first duty station, eager to begin as platoon leaders.

As an instructor in the Department of Civil and Mechanical Engineering, I have a primary responsibility to educate the students in civil engineering. All of the faculty and staff have the additional mission of inspiring students as they aspire to become Army leaders. After eight years of leadership and engineering experience in the Army, I began the Instructor Summer Workshop (ISW) in the Department of Civil and Mechanical Engineering and the process of becoming a new instructor at the Academy. I learned that I would be teaching fluid mechanics, which I had last seen in the classroom over nine years before. ISW was a critical opportunity for me to not only relearn fluid mechanics, but to learn the fundamentals of teaching.

My military experience as a deployed company commander in war-time Iraq made me unique among the other new faculty. To be truly successful as an instructor, I need to not only convey the course material, but inspire the students through my experience as an Army engineer and leader. Leadership and experience can be worked into the course of instruction, exercises and design problems, helping students see how their developmental experience in the classroom will apply when they begin their career in the Army.

As a construction company commander, I saw the impact that officers with a strong engineering background had in the Army. My engineering background was critical to successfully tackling diverse missions, including rapid runway repair, road construction, and obstacle reduction. This experience has helped me create the bridge between classroom instruction and engineering practice and engage the students in the classroom. Establishing the

link between classroom instruction, leadership training and the expectations of what they will do as leaders and engineers in the Army both educates and inspires the students.

Learning to Teach

In my eight years in the Army since leaving college, I had accumulated a vast amount of experience, mainly in leadership, management and construction. Unlike the majority of the rotating military faculty at West Point, who prepare to teach by attending graduate school, I left my company in Iraq and came directly to West Point. Transitioning from being a construction company commander responsible for 130 soldiers, millions of dollars worth of tools and construction equipment and the reconstruction of the main runway at Balad Airbase north of Baghdad to being an instructor at West Point was one of the most challenging and rewarding steps in my career.

About 67% of the instructors at West Point are assigned to a rotating three year assignment. After two years in graduate school and three years teaching at the Academy, officers rotate back into a regular Army assignment. Due to this high turnover within the faculty, each department has a summer new instructor training workshop to ensure the instructors maintain a consistent high standard of instruction. Without a current graduate academic experience, I relied heavily on the Instructor Summer Workshop (ISW) to learn how to not just be an adequate teacher, but an exemplary one.

The central tenant of the Civil and Mechanical Engineering (C&ME) model is of the teacher as a role model. This is why the Department recruits professional officers with proven leadership experience and diverse backgrounds. During ISW, I learned about teaching and learning theory and how the C&ME model supports student learning.

The C&ME Model:

- Structured organization
 - Based on learning objectives
 - Appropriate to the subject matter
 - Varied, to appeal to different learning styles
- Engaging presentation
 - Clear written and verbal communication
 - High degree of contact with the students
 - Physical models and demonstrations
- Enthusiasm
- Positive rapport with students
- Frequent assessment of student learning
 - Classroom assessment techniques
 - Out-of-class homework and projects
- Appropriate use of technology

As we delved deeper into the workshop, we saw example classes taught by veteran instructors, including senior military faculty, civilian professors and junior military instructors. The common themes between the classes included energy, engagement, structure, and organization, all components of the teaching model. The example classes showed us the high standard at which classes in the department are taught.

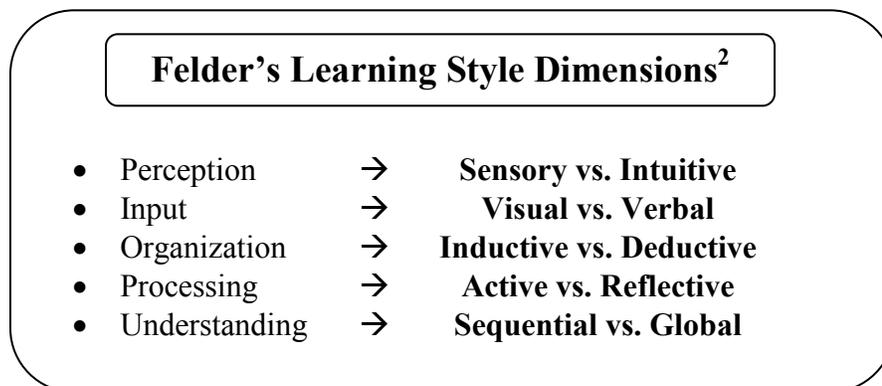
At first, I was skeptical if the antics and performance was really necessary or even appropriate. As Joseph Lowman states, “College classrooms are fundamentally dramatic arenas in which the teacher is the focal point, like the actor or orator on stage.”¹ My first semester experience validated this for me, with class participation and motivation relating directly to the energy that I put into the lecture.

Learning to Excel at Teaching

Within ISW, the three areas that helped me learn about teaching the most were basic teaching theory on student learning, class structure, and classroom presentation. We presented seven practice lessons that were assessed by the senior faculty and our peers, utilizing the principles that we were learning in the seminar. While some new instructors quickly mastered the basic teaching techniques, I struggled with the new ideas and with relearning fluid mechanics. The tight feedback loop that the assessments provided quickly helped me improve my performance, so that by the end of the workshop, I not only was getting better at teaching, I was having fun too.

During the first part of the ISW seminar, we looked at how students learn, since the net result of good teaching is good learning. We covered several areas; the ones that I found most helpful were Felder’s learning dimensions and Bloom’s taxonomy of educational objectives.

Felder looked at how students learned, and his model describes five dimensions of learning. Students have natural modes that they optimally receive and process educational content. Instructors also have modes in which they present material, and understanding how students learn greatly helps the instructor teach effectively. The dimensions are listed below:



Students respond well to instruction that matches their learning style. Students are able to adapt to instruction that does not perfectly match their preferred learning style, so the instructor does not have to teach exactly to each student's style. Effective teaching touches on all of the learning styles, which has two effects. First, this reaches students with different learning styles, to keep all of the students involved with the lesson. Secondly, students who are taught in a single mode do not experience learning growth. I strove to vary my teaching to touch the variety of learning styles in the class. Additionally, when explaining a particularly difficult example to a struggling student was easier after analyzing their learning style and then tailoring the explanation to match their style. Many times in fluid mechanics, words or even drawings on the board could not adequately explain a topic to a student. What was more effective for the visual learner was a physical model. Engineering experience from the Army often helped the global learner see how their classroom experience prepares them for their future.

Integrating leadership and real world examples into the lessons help enable learning on several levels. Examples of engineering leadership help put what would otherwise be generic examples into proper context. This helps the global learner link what they are learning in the lesson to what they will do as a leader and as an engineer. To help stimulate the student's leadership development, I included group work in the class room and group projects outside the classroom. This was especially effective in the longer term group projects, such as the Turbine Design Project in fluid mechanics or in the Watershed Analysis and Design Project in Hydrology and Hydraulic Design. My students responded to the leadership challenges that a complex project presented.

Additionally, as a new instructor, I found that Bloom's taxonomy of educational objectives was very helpful. One of the ultimate objectives in an engineering curriculum is developing the students' ability to think critically. In my experience as an engineering undergraduate student, homework problems were challenging in that they took a long time to complete, but they did not necessarily provoke higher level thinking. Since engineers need to be able to design and evaluate, higher level tasks need to be worked into the curriculum of every engineering course. Bloom's taxonomy with example action verbs is listed below:

Bloom's Taxonomy of Educational Objectives³

- **Evaluation:** assess, contrast, critique, justify, validate
- **Synthesis:** classify, create, design, explain, plan, simplify
- **Analysis:** contrast, derive, differentiate, generate, infer, model
- **Application:** apply, calculate, demonstrate, operate, predict, solve
- **Comprehension:** demonstrate, estimate, explain, rephrase, summarize
- **Knowledge:** list, name, recite

Over the course of the semester, what I found interesting was how the students responded to each new challenge. Some students could readily work at higher levels on Bloom's taxonomy, while others struggled each time they worked on a problem that was incrementally higher on the hierarchy. Most students had little difficulty with the first three tiers; the majority of their prior education has been at the knowledge, comprehension and application levels. The challenge is building their skills and confidence with tasks of greater complexity, truly preparing them for real engineering design problems.

Often, the students helped each other see how to work on the next level. Through group work and by selecting the groups and teams carefully, I could assess how each group was meeting the new challenges, and assess student leadership growth. Sometimes a strong student would lead a weaker student through an exercise, allowing the weaker student to follow along. To break up this dynamic, I would periodically change the groups around, grouping some of the weaker students together. The students, who were used to sitting back, suddenly found that one of them had to step up into a leadership role. These groups, though not always producing the best results, often made the most progress.

The biggest hurdle for many students was the transition from text book questions with exact solutions, to more complex design questions that required them to make assumptions and estimates and had multiple viable solutions. While working through these types of problems, I brought in some of my Army engineer experience. Sometimes this involved modifying questions to reflect challenges that I have seen and other times we talked about lessons learned from various engineering problems. For instance, during the reconstruction of Balad Airfield in post-war Iraq, we met incredible difficulty with supplies, equipment, and weather conditions. In that case, we were given the construction standard, then had to determine a design that would meet the standard with the available materials, equipment and soldiers. This helped link their classroom experience with engineering practice, enabling them to tackle design problems in their projects and homework.

With a basic understanding of student learning, the next step was learning how to structure a lesson. Having never taught or developed a class, learning how to plan a lesson using the C&ME model was invaluable. The C&ME model has a solid basis in the learning theories covered above. The method helped focus the lesson and my preparation for each class, so I was able to provide a better product for my students. Each lesson is based on learning objectives. Learning objectives support course objectives, and they describe what a student should be able to accomplish following the lesson. Action verbs from appropriate levels of Bloom's taxonomy are used to formulate these learning objectives. The learning objectives are examined to see which objectives will be covered in class and which objectives will be covered by the student outside class. After determining the learning objectives, the class outline and board notes are prepared. The board notes help frame the class into digestible sections on the blackboard. Using this process, visual aids, demonstrations, practical experience and in class exercises are integrated to build a coherent lesson. A thorough lesson plan includes transitions between topics and pre-planned thought-provoking questions. In the middle of the lesson, in front of the class, I found it difficult to formulate insightful, meaningful and un-ambiguous questions. These questions are best formulated prior to class in the planning stage. This allowed me to focus on student

responses and thoroughly engage the class. The preparation and board notes become the first rehearsal of the lesson.

The third area that made the most impact on my first semester of teaching was working on the communication skills involved in presenting a class. As an Army officer with eight years of experience, I have presented my share of information briefings to various audiences. Teaching, however, is different than briefing. Teaching, within the C&ME model, is a highly physical and interactive performance. The foundation is clear verbal communication supported by clearly written chalkboards. These are augmented with demonstrations, models, slides and overheads as appropriate, and the entire delivery is infused with enthusiasm and energy. Throughout the class, students are kept involved by the use of meaningful and directed questions.

As a new instructor, the two areas that I had to invest the most energy and preparation were mastering the material and lesson performance. During the seven practice ISW classes, the feedback from senior faculty and from my peers helped me identify and focus on specific areas for improvement.

Another strength of the Academy is the resources available to help instructors continue to improve their performance. The Center for Teaching Excellence offers a Master Teacher Program involving a monthly seminar. This provides a forum to meet instructors from across the Academy and share in their issues, solutions and ideas. The discussion on student motivation related to my efforts to bring engineering experience and military leadership into the classroom.

Impacting Students Beyond the Classroom

During my first semester, I focused my energy on teaching fluid mechanics and seeking ways to improve my classroom performance. I looked for additional outlets that allowed me to impact students beyond my classroom. The local student chapter of ASCE asked me to speak about my experience as a civil engineer and a construction company commander in Iraq. This forum provided an opportunity to show the impact civil engineers were having on the reconstruction in Iraq. In planning the talk, I wanted to ensure that the briefing would be inspiring, relevant and informative to my primary audience, the students. While much of the media focus from Iraq tends to show national and policy issues, my talk helped these students see what they, as a future platoon leader will see after they graduate. The students were engrossed by the talk, seeing how their classes helped prepare them for the challenges that they will face.

The audience included several second year students who were interested in civil engineering, but were still undecided on their major. Seeing the positive impact that civil engineers have in the rebuilding of Iraq, several of the students were inspired by my talk to be civil engineer majors and eventually engineer officers. Following the talk, one of the second year students asked me, "Sir, what class do you teach, I want to take it." Clearly I had impacted the students in a strong, positive way, giving the students a civil engineering role model.

Results of My First Semester

As I finished grading the term end exams, calculating the final grades, and filing the course material, I took a few minutes to reflect on the previous semester. Primarily, I wanted to determine if I had completed my first semester teaching successfully.

Successful teaching can be looked at through several criteria, including final grades, quality of student work done and many other means. The most valuable and the most accurate means is by asking the students. West Point, like many other institutions, has an end of term survey that is administered to the students, where they rate the quality of the course, the value to the student, and the performance of the instructor. There is a strong correlation between student-teacher ratings and teacher performance⁴ validating using student feedback to assess success as an instructor.

The Military Academy asks every student nine questions at the end of each course, and the Department of Civil and Mechanical Engineering asks an additional twelve questions. Students rate statements about the course and the instructor on scale of one (strongly disagree) to five (strongly agree). The majority of these questions directly reflect instructor performance. Figure 1 displays the questions and ratings corresponding to the academy wide questions and Figure 2 displays the questions and ratings corresponding to the department wide questions. In nearly every case, my instructor rating is greater than the department wide and academy wide averages. Particularly strong ratings were received in the following areas, directly relating to successful instruction:

Course End Student Feedback

- Instructor cared about my performance in this course.
- Instructor demonstrated respect for cadets as individuals.
- Motivation to learn and continue learning increased.
- My critical thinking ability increased.
- Instructor served as a professional role model.
- Instructor demonstrated depth of knowledge.
- Instructor had a plan for every lesson.
- Instructor cares about my learning.
- Instructor demonstrated positive expectations.
- Instructor gave me timely, accurate feedback.

The results from the survey are backed up by the positive feedback from the students and the number of students returning to my class to take hydrology, the follow on course for civil and environmental engineers.

My students responded to real world examples of engineering and leadership that I brought into the classroom. They were eager to share the varied experience that I brought to the

class, whether it related to the lesson or not. While some stories led to tangents away from the lesson they were still valuable in establishing the role of the instructor as a role model.

Another means of determining teaching success is through peer teaching assessments. Figure 3 and Figure 4 is a copy of the teaching assessment conducted by LTC Ron Welch. Quality assessments provide insight into strengths and areas of improvement. While LTC Welch identified many areas of improvement, he noted many strengths and a vast improvement over my teaching performance during ISW. Periodic teaching assessments have really enabled me to identify and work on areas that need additional work. As a new member of the teaching profession, I am still a student, learning how to improve my teaching performance. The process for me began in ISW: planning, executing, reflecting and improving.

Conclusion

While quality instruction is a goal to strive for, it can never be truly reached. There is always room for improvement, given time and resources. The true teaching professional continually seeks to improve his performance. In the upcoming semesters, I intend on using the resources available within the Center for Teaching Excellence and will focus on further integrating leadership application and assessment into the classroom.

Bibliography

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2. Felder, Richard M. "Reaching the Second Tier – Learning Styles in College Science Education." Journal of College Science Teaching 23 (5): 286-290.
3. Bloom, Benjamin S. Taxonomy of Educational Objectives, Book 1 Cognitive Domain, Longman, New York: Longman 1954.
4. Felder, Richard M. "What do they Know Anyway?" Chemical Engineering Education, 26, p 134, Summer 1992.

Biography

Captain Paul Moody is a United States Army Officer serving as an instructor at the United States Military Academy. Paul currently teaches fluid mechanics and hydrology. His previous military assignments include platoon leader in the 44th Engineer Battalion Camp Howze Korea and company commander, A Company, 864th Engineer Battalion, Fort Lewis, Washington. Paul is a graduate of the Massachusetts Institute of Technology with a 1994 Science Bachelor degree in Civil Engineering and a 1996 Science Masters degree in Civil and Environmental Engineering. Paul lives in Monroe, New York.

Term 04-1 Course Feedback, ME362
USMA Questions

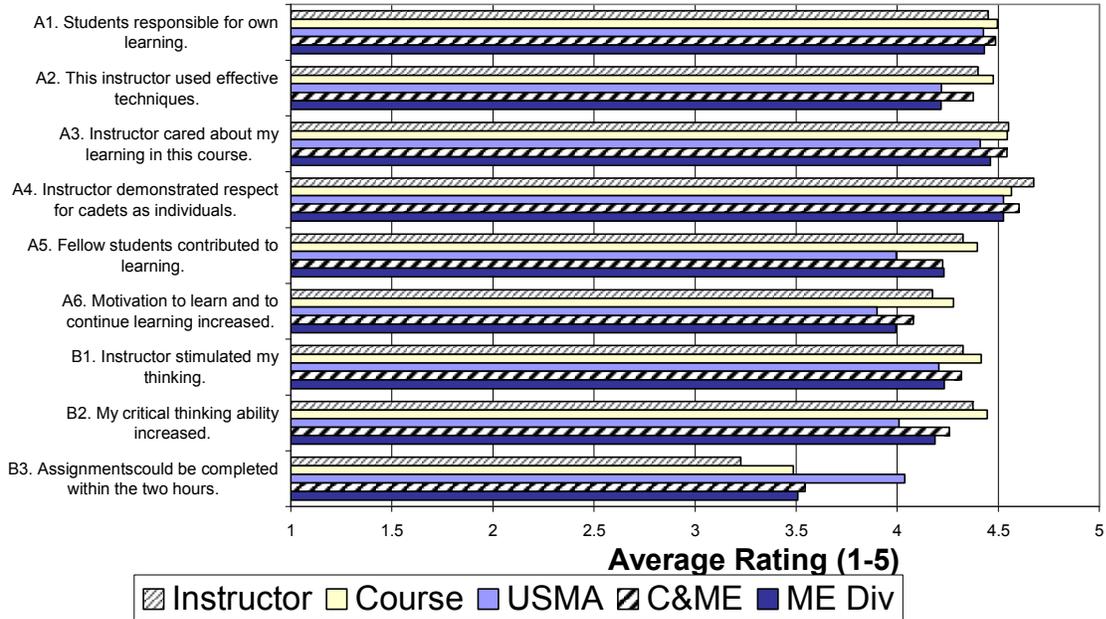


Figure 1: West Point End of Course Feedback Results.

Term 04-1 Course Feedback, ME362
C&ME Questions

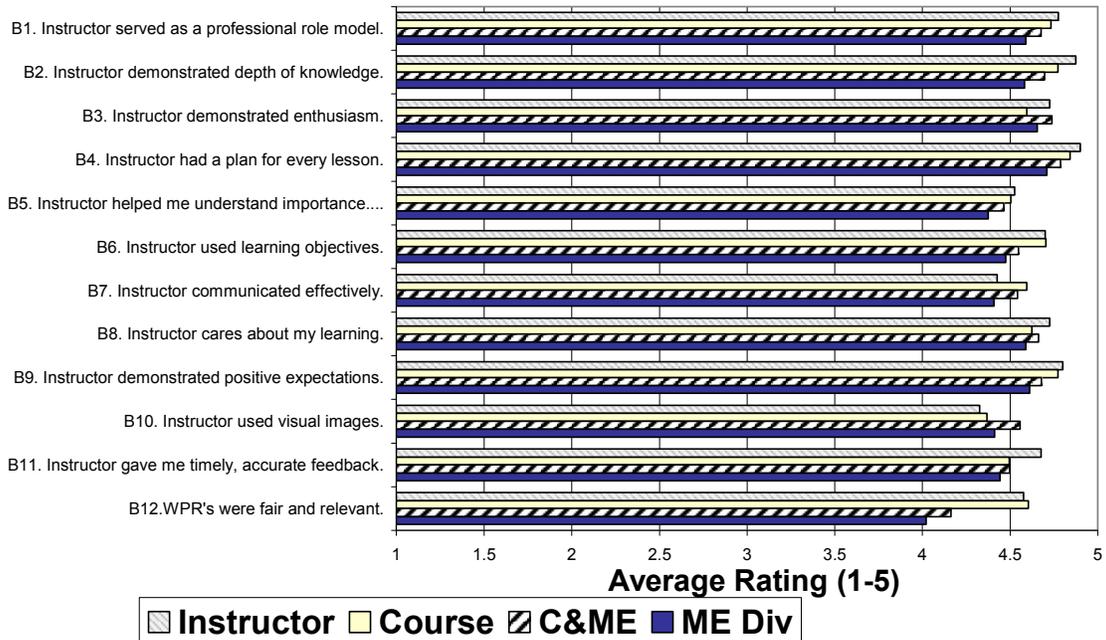


Figure 2: Department of Civil and Mechanical Engineering End of Course Feedback Results.

TEACHING ASSESSMENT WORKSHEET

INSTRUCTOR: CAF MOODY

ASSESSED BY: LTC WELCH

LESSON TOPIC: Pump SELECTION

DATE: 17 Nov 03

STRENGTHS:

- 1 Pipe slide show - great motivator ; great use of PP to show charts
- 2 Great movement, contact of class ; movement to outlet answering, etc.
- 3 pump - training aid - showed all
- 4 Spread of questions ; lots of cadets jumping in with input -
- 5 PREPO = in class boards ; CONSISTENT COLOR scheme
- 6 Great class interaction
- 7 CURVE / DEFINITION DEVELOPMENT @ SAME TIME
- 8 SOUND EFFECTS IN PP →
- 9 CHECK QUESTIONS - JUST SAY EVERYBODY SINCE YOU WANT THEM ALL TO PARTICIPATE
- 10 GOOD ANSWER ON QUANTATION QUESTION ; TURBINE / PADDLE BOAT → AXIAL FLOW
- ~~11 GOOD TRANSITIONS → W.S. SEA~~
- 12 Groups for WS... ; Checking on work

AREAS FOR IMPROVEMENT:

- 13 Desks set-up in groups - many have boards to their back
- ~~14~~ When showing actual pump - you had gear back to 1/2 - so must spend
- ~~15~~ more time showing pump
- 16 pump provides power - should be need more power to run?
- 17 Could use some BETTER PRINTING - completion of letters for visibility
- 18 looks like Ft per m on Bd 16 (Ft); (m)
- 19 ↑ straighter lines Bd 4.
- 20 GAP BETWEEN flow rate / SYSTEM CURVE - Board 5
- 21 in groups - make them produce one gp solution. In most groups, working @
- ~~22~~ individuals with some checking.
- 23
- 24

Figure 3: Teaching Assessment Worksheet Front

25
26
27
28
29
30
31
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33
34
35

I would love to be in your
class as a student.
😊
Keep up the GREAT JOB!!

	Needs Work	Good	Excellent	Remarks
TECHNICAL EXPERTISE				
Command of the Subject Matter			✓	
LESSON ORGANIZATION				
Lesson Objectives		✓		
Organization of Boards & Classroom Activities		✓		
CONDUCT OF THE CLASS				
Enthusiasm, Energy, and Confidence			✓	showing excitement in own way!
Orientation to the Subject Matter			✓	REAC would - close to us, NYE
Clarity of Presentation (boards, viewgraphs, etc.)	✓			WRITING CAN BE IMPROVED - CERTAIN LETTERS
Clarity & Precision of Explanations			✓	
Voice (volume, speed, variation)			✓	MAX EVEN - VERY subtle changes
Questioning & Answering Questions			✓	Occasionally using lots of Jump Balls - class responds well
Contact with Students			✓	
Visual Aids and Demonstrations			✓	
Time Management				2 hour block
Appropriate Use of Textbook		✓		RAC
THE CLASSROOM ENVIRONMENT				
Classroom Appearance			✓	Program obj./outcomes, fluid examples
OVERALL ASSESSMENT:				
Are the students who attended this class adequately prepared to accomplish the Lesson Objectives?				<input type="checkbox"/> No <input type="checkbox"/> Not sure <input checked="" type="checkbox"/> Yes

Specific areas on which to focus during your next class:

- ^{BRITNESS} IN EXPLANATION Pump provides power? OR POWER REQUIRED BY Pump?
3 across works the same
- IF NOT REALLY GROUP WORK - MAYBE NO NEED to put into groups w/ boards to boards
- CONTINUE WORKING ON WRITING - MANY LETTERS NOT COMPLETE - MOSTLY WITH WHITE - large chalk size?

Figure 4: Teaching Assessment Worksheet Back