Teaching for Learning in the 21st Century:  
A Pedagogical Approach for Using an Advanced Technology Classroom

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“Technology is only useful in the classroom when our teaching is adapted to make the best use of it.”
- Dr. Matthew Ohland, Engineering Education, Purdue University
  (2010 Presentation at the United States Military Academy)

Introduction
While in graduate school, I attended a faculty and graduate student workshop on the topic of the 21st Century Classroom. The discussion centered on the technology and equipment necessary to enhance student learning. Since education is more than simply the transfer of information from the teacher’s mind to the student’s mind, a new type of classroom should encourage more than mere listening by students; it should provide hands-on learning experiences and opportunities to interact with the subject material in real and practical ways. During the workshop, many impressive ideas were presented: from state-of-the-art multimedia components to finding ways to bring three-dimensional objects or virtual humans into the class. The critical conclusion was that whatever else the 21st Century Classroom might do, it must help create and encourage an immersive and active learning environment where teachers can more effectively connect with students.

Background
My excitement toward using a “21st Century Classroom” stemmed from the reading and preparation I did during my graduate studies. As a new instructor, I wanted to ensure my classroom encouraged active learning by engaging students, motivating them to participate in discussions, using groups for problem-solving challenges, and providing real world applications to the theory being presented. Clearly these goals are not new. Chickering and Gamson (1991) state that effective education encourages:

- Increased contact between students and faculty
- Cooperation among students
- Active learning
- Timely and specific feedback,
- Time on task
- High expectations
- Respect of diverse abilities and learning styles
Evidence shows that active learning leads not only to increased understanding and retention but also enhances the student’s ability to construct knowledge (DeHann, 2005). Bonwell and Eison (1991) state, “To be actively involved, students must engage in such higher-order thinking tasks as analysis, synthesis, and evaluation.” I believed that the technology in the classroom might help me guide students further along Bloom’s taxonomy. I hoped it would ensure the participation of the majority of students by enabling me to find effective techniques that appealed to visual, aural, reading/writing, and kinesthetic learners alike (Tanner and Allen, 2004). Howard Gardner, in Changing Minds, suggests that improved technology could enable teaching to become more personalized to the student, thus creating an opportunity to bridge multiple intelligences and learning styles simultaneously (Gardner, 2006). Therefore, the approaches I took in using the classroom were inclusive of all dimensions of student preferences and styles for learning (Felder and Silverman, 1988).

Arriving as a new instructor at West Point, I was quickly introduced to the features of the Center for Teaching Excellence’s new multimedia classroom. The room holds 18 students comfortably, and is equipped with a smart board at the front of the classroom, six plasma flat screens with writable overlays that enable similar smart board effects, computer plug-in stations for students, video-teleconferencing capability, and assorted dry-erase boards. After receiving guidance and advice from the instructional technology manager and a fellow instructor who had been using the room, I began utilizing the room on a regular basis for my first academic course, PL300, Military Leadership, a survey course on leadership theory within the context of the military profession. While my use of the room did not revolutionize my teaching methods, it did succeed in both enhancing the students’ classroom experience and facilitate great ease of use with what I knew to be good teaching practices.

The Pedagogical Approach
The technology in the room facilitated many opportunities that greatly improved student learning. While students enjoyed the change of location from our normal classroom and the change in my instructional method, as a result of using the room, they appeared to see the academic benefit as well. In a course survey, one student stated, “The use of the multimedia classroom was very beneficial because I am a visual learner and I liked having all of the material we needed in a concise form on the walls around us.” Another student added, “I felt like we got a lot of really good and beneficial group work done in the multimedia classroom.” These two students’ comments highlight only a couple of the many benefits that the 21st Century Classroom offers to teachers and students. In addition to making learning visual, active, and collaborative, the classroom allowed me to highlight student work more easily, focus students on the topic discussion without the pressure of taking notes because we were creating notes as we conducted class, naturally move part of the learning process outside of the classroom through either pre-class preparation assignments or take-home note packets, and effortlessly combine the best ideas from the class into a single document.

There were several instructional methods that I found to be effective as I put the classroom to use. On occasion, I began class by providing 15 to 20 minutes of individual work time. I assigned various students the same question and had the students work separately. I observed the students working, answered their questions, and looked for solutions demonstrating comprehension of the subject
material. I then selected students with answers that most effectively combined that lesson’s theory and evidence from the case for each question to bring up their work on one of the plasma screens. The remainder of class was spent discussing what was displayed; allowing those whose work was being highlighted to discuss their thoughts and explain how they reached their conclusions, and enabling others who were not selected to question and critique. This approach established a comfortable and non-embarrassing setting for peer evaluation. I found that it also benefited students who tend to be more reflective and enjoy individual assignments. In addition, those who had been struggling with the assignment were able to clearly see things they had missed. Finally, we were able to collectively improve the answers from the selected students and send everyone home with a solid solution to that day’s problems. One variation that I took to this exercise was to assign all of the questions ahead of time as study questions with the expectation that students come in prepared to tackle any one of the problems. I even had them email me their solutions prior to class so that I could review their work ahead of time thus allowing the entire class period for discussion. Looking at their work before class was particularly efficient on days when the material required more explanation on my part and processing on theirs.

A second method that I put into use in the multimedia classroom focused more on group work. The benefits to collaborative learning environments include testing one’s ideas, observing others, developing a self-identity, and building problem-solving skills (National Research Council, 2003). Furthermore, R. Johnson and D. Johnson show the significant lasting effects of collaborative methods over competitive and individualistic approaches with regard to increased student performance, content mastery, and capability to handle complex tasks (1994). With this in mind, I adjusted the individual method discussed earlier. I assigned groups a question and allowed them 15-20 minutes to prepare an answer. We spent the remainder of the class period with the students briefing their classmates, taking questions, and improving their answers. The clear advantage to this method was the great confidence with which students presented the material after having discussed it in a group. The drawback was a somewhat limited discussion, as only the assigned students had thought about the other questions. My solution was to assign the questions as an individual study assignment for turn-in. When they arrived in class I then assigned them to groups with a specific question.

I varied this approach in several ways. Sometimes I allowed them to select their own groups instead of being assigned; other times I allowed them to choose their group questions. I found that allowing self-selection often increased both their motivation and the quality of their responses. Another variation was to assign groups and their group question before class and require them to come to class with a prepared solution. I again faced the same issue as before (limited discussion), so in response I had groups prepare all of the questions and bring their entire presentation to class. I would then choose one group to present all of their responses while other groups would ask questions or present their answers if they differed greatly. On other occasions, I made the presentations due before class, reviewed them, and then had each group brief their best answer or one that enabled me to focus on a particular aspect of the subject. Using the advanced media classroom enabled me to provide immediate feedback and create a classroom dialogue centered on reviewing not only the product but, more importantly, the
process that my students were using. We were able to engage on what the appropriate process should be and make revisions, in effect practicing the process or problem solving approach.

Assessment

Learning Styles
I assessed the efficacy of using the advanced media classroom in a variety of ways. First, I considered the appropriateness of the classroom with regard to the learning styles of my students. I had them complete a learning styles questionnaire created by Soloman and Felder at North Carolina State and available on the public domain at: http://www.engr.ncsu.edu/learningstyles/ilsweb.html. I then recorded and averaged my student’s scores and found the following in aggregate:

<table>
<thead>
<tr>
<th></th>
<th>Active/Reflective</th>
<th>Sensing/Intuitive</th>
<th>Visual/Verbal</th>
<th>Sequential/Global</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Student Averages</strong></td>
<td>6.4</td>
<td>6.8</td>
<td>7.8</td>
<td>6.4</td>
</tr>
<tr>
<td><strong>Std Dev</strong></td>
<td>2.3</td>
<td>2.7</td>
<td>2.7</td>
<td>2.2</td>
</tr>
<tr>
<td><strong>Median</strong></td>
<td>6</td>
<td>7</td>
<td>9</td>
<td>6</td>
</tr>
<tr>
<td><strong>Conclusion</strong></td>
<td>Slightly Active</td>
<td>Slightly Sensing</td>
<td>Stronger Visual</td>
<td>Slightly Sequential</td>
</tr>
</tbody>
</table>

Given the previous discussion regarding pedagogical approaches for using the classroom in a more active and visual manner, I felt confident that this was an appropriate teaching strategy for my students. Additionally, as I prepared for my classes in this classroom, I structured them to be more sensing and sequential in nature.

Student Performance
At the end of the semester, I compared student grades with their learning styles to see if I could draw a correlation between their learning styles and the use of the advanced media classroom. Only in a few instances, where a student was extremely reflective or verbal (scored a 1) did there seem to be any significant relationship (negative in these cases, up to 2 letter grades) between learning style and grade. I attribute this lack of correlation to the fact that I used multiple other teaching strategies throughout the semester, not relying solely on the technology classroom as my only teaching approach. In fact, those students who tended to do best in the course tended to be balance in their learning styles in at least three style dimensions.

Another student performance related assessment measure that I used was looking at specific midterm and term end questions that related to classes taught in the advanced technology classroom as compared to traditional classroom use. With regard to multiple choice questions, I saw a stark difference between questions that I could tie to the two classroom methodologies. On average, 13% of students answered multimedia classroom instructed questions incorrectly, compared to 32% of students who missed questions covered only in the traditional classroom. With regard to essay questions, I found no significant difference in the performance of cadets. I attribute this to the nature of the assessment: short term retention. I believe that if I were to research deeper, long term transfer of learning, I might see evidence that the opportunity to experiment with the material in a richer way, as the multimedia
classroom allows, does in fact result in greater learning. The obvious challenge in this assessment is having access to the students a year or two after the class has completed.

**Student Motivation & Group Work**

Where I did see significant achievement was both in terms of classroom participation and peer instruction. My personal observations of student involvement and discourse were clearly higher in the media classroom than the traditional classroom. Students also felt a greater involvement and benefit from their peers. In looking at two end of course feedbacks, one from PL300 (a course where I used the technology classroom for 20% of my classes) and MG382 (a course that I used the classroom only once), I see a significant difference in the perspective of the students.

<table>
<thead>
<tr>
<th></th>
<th>PL300 (09-1)</th>
<th>MG382 (10-1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A2. This instructor used effective techniques for learning, both in class and for out-of-class assignments.</td>
<td>4.59</td>
<td>4.33</td>
</tr>
<tr>
<td>A5. My fellow students contributed to my learning in this course.</td>
<td>4.28</td>
<td>4.19</td>
</tr>
</tbody>
</table>

One student commented that “the technology in the library made every cadet learn and teach everyone in the class.” Although I did not see a measureable difference in student performances, students felt more engaged in the technology classroom and with each other. With regard to value gained in having students gain successful work experience in groups and the intangible gains by increasing social capital within the class, I feel confident that there is tremendous value in continuing to use the room.

Additionally, students did recognize the extra work being asked of them and noted so on the end of course surveys, as my class’ average score in the area “I had the time to adequately prepare to demonstrate optimum academic performance” was slightly lower (Course = 4.04, My Class = 3.95, on a 5-point scale where 5 was “Strongly Agree”) than the course average of my fellow instructors. My students, however, also recognized the added value of working with the material in a more interactive way as the score in “I understood the learning outcomes desired for the course and each lesson” was significantly higher than the course average (Course = 4.19, My Class = 4.41). Additionally, in regard to application of course material, “I feel more confident that I can develop innovative and creative solutions to confront ambiguous situations,” my class again outscored my fellow “Military Leadership” instructors (Course = 4.25, My Class = 4.54).

A final assessment measure that I used was comparing the use of a collaborative learning technique (“Pass the Problem), doing it once in the traditional classroom and then doing it in the multimedia class. In both cases, I asked the students if they felt it was an effective learning exercise. The results were interesting.
<table>
<thead>
<tr>
<th>Pass the Problem (Traditional)</th>
<th>Pass the Problem (Advanced Media)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Answers</strong></td>
<td><strong>Responses</strong></td>
</tr>
<tr>
<td>Strongly Agree</td>
<td>9.09%</td>
</tr>
<tr>
<td>Agree</td>
<td>50.9%</td>
</tr>
<tr>
<td>Neither Agree nor Disagree</td>
<td>30.9%</td>
</tr>
<tr>
<td>Disagree</td>
<td>9.09%</td>
</tr>
<tr>
<td>Strongly Disagree</td>
<td>0%</td>
</tr>
</tbody>
</table>

Just by changing the location to one that utilized the techniques available in the multimedia classroom, students felt that their learning experience had been enhanced.

**Conclusion**

I am excited about the opportunities that the 21st Century Classroom makes possible. I did learn that the advanced technology classroom was not the best match for every lesson and learned to be very deliberate in my selection of which lessons to conduct there. Specifically, classes focused on discussion such as cases or simulations worked extremely well in this environment, whereas, classes where brand new material was introduced or a more Socratic dialogue was desired fared better in the modern classroom. I do believe that any technology, or teaching strategy for that matter, when randomly and haphazardly applied to any learning environment will amplify poor teaching. Critics of integrating technology into the classroom often cite the entertainment value over actual sound, disciplined learning. This can be true. If an instructor is not prepared and does not have a back-up plan for when the flat screen monitors do not work, then that instructor will waste valuable teaching time. I would argue, however, that the same can be said for any innovative teaching strategy and is not reason enough to shy away from experimenting with something that does appear to have a valid purpose.

With that small element of caution in mind, I strongly encourage any instructor of any discipline who has the opportunity to test their teaching prowess in such facilities to certainly do so. Not only does the technology allow the instructor to find new, innovative and creative ways to present the material but it also encourages different learning styles. Wilbert J. McKeachie believes that the use of technology in the classroom can build confidence for future challenges, encourage teamwork, improve inter-personal skills, and enhance cognitive development (2005). My students agreed: 73 percent of 71 students stated that using the classroom improved their learning. As an instructor, I have also found that many of Barkley, Cross, and Major’s collaborative learning techniques are significantly easier to execute in this type of classroom (2004). The “Pass the Problem” exercise, for example, is extremely easy with a single computer at each station and the ability to rotate groups around the room. Additionally, the “Jigsaw” activity, where students become experts and then teach each other, is easy to conduct as either an out-of-class prep or entirely within-the-class project. In his briefing to West Point faculty, Dr. Ohland challenged instructors to get “beyond hands-on, to minds-on.” Regardless of the teaching vehicle used,
the bottom line is this: the use of this type of classroom improves student learning by creating an atmosphere that encourages debate, questioning, and discussion, pushing learning out of the classroom, and developing students who are critical thinkers and lifelong learners.
References


