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**AC 2012-4762: EVALUATION OF DYKNOW IN A CHEMICAL ENGINEERING CURRICULUM**

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## Evaluation of DYKNOW in a ChE Curriculum

### (Poster)

In the fall of 2008, all professors at small Midwestern University were given a Toshiba Tablet PC Portege m400, with the intent of increasing technology use in the classroom. A Tablet PC differs from a regular laptop PC, in that it allows the user to rotate the display 180 degrees to cover up the integrated keyboard. In this mode, the user interface is a touch screen controlled by a digital pen. The digital pen can substitute for a mouse and allows the user to include natural handwriting in programs like MS Word and PowerPoint. It was anticipated that the advantage of the tablet over a traditional laptop would be the ability to easily annotate PowerPoint slides. The reason that this would be so helpful is that a number of textbooks today supply the professor with pre-prepared lecture notes in PowerPoint format. It was thought that using these existing PowerPoint slides would alleviate a lot of the time needed to prepare lecture notes, therefore, free up the professor to focus more on using the technology. However, as it turned out, students complained that this format was boring and not interactive. Also, faculty members started to read educational reports like “Death by PowerPoint<sup>1</sup>” that proved that using PowerPoint slides alone as your main lecture method is neither effective nor recommended. It was then decided that there was a better way to deliver the lectures by making the classes more interactive, but still using some of the advantages which technology can bring to the classroom. Thus, a classroom was set up where all students were given Tablet PCs and DYKNOW Monitor was chosen as the class management software.

DYKNOW is a classroom management software that allows instructors to “Supervise, Guide and Interact<sup>2</sup>” with students who have a Tablet PC and internet access during lecture. DYKNOW refers to “supervise” as the instructor’s ability to view and capture student’s screens while they are connected to the Monitor system. In other words, if set up correctly, the Monitor system allows the instructor to see exactly what the student has on his or her computer screen. This was useful in class when students were given practice problems and/or active learning exercises. Some students are too embarrassed or shy to ask for help. They commonly say to themselves, “it will become clear when the instructor goes over the problem”. The Monitor allows the instructor to see how far along a student has progressed on the problem, and then intervene when help is needed. Not to solve the problem, but rather to guide students to solve the problem on their own. Another nice feature is the screen capture ability of DYKNOW. For example, in an energy balance class, students frequently choose different reference states (T, P) to make the solution of a particular problem easier. The instructor can then capture the student’s screen and then show it to the rest of the class. Sometimes the instructor can comment on the utility/uniqueness of a student’s solution method or use it to show a common mistake. However, it is not recommended to use as a way to single out wrong answers, as it may make students apprehensive, due to the fact that they may feel like if they make a mistake it will be shown to “entire world”. A typical response from course reviews about this feature was: “I knew the professor was watching what I was doing so it helped me from slacking when practice problems were given”.

DYKNOW refers to “guide” to enable the instructor to access and websites and applications. By far, this was the **most useful** DYKNOW tool!! When students are given electronic devices and internet access, they will inevitably be tempted to use applications not intended for use in the classroom. Facebook and campus email are at the top of the list. DYKNOW Monitor allows the instructor to take control of the content being delivered during lecture. If internet access is desired, the instructor can

allow students internet access. If not, with a few simple commands, the instructor can limit what is available to the student.

Finally, DYKNOW refers to “interact” to allow the instructor to use DYKNOW like a personal response device (clicker). The instructor can send a poll or chart to students. In fact, there is an anonymous poll continually running, where students can notify the instructor at any time if they understand or don’t understand something. Due to the small class sizes at the University (max 30 students), this functionality of DYKNOW was seldom used, however, it might be more beneficial for larger class sizes.

While DYKNOW has a lot of functionality, the most important point of the study was “Did it help student learning?” Below is a table that shows student performance in two classes, engineering economics and energy balances. Both classes were first taught in a traditional lecture mode and then they were taught using the Tablet PC with the DYKNOW management software. There were no statistical differences between any of the test groups as far as incoming GPA, gender or class standing.

	ES 382 Engineering Economics		ChE 212 Energy Balances	
	Traditional Lecture	With DYKNOW	Traditional Lecture	With DYKNOW
Class Average	77%	79%	76%	79%
% of Class below C	21%	14%	29%	11%
Course Review	4.2/5.0	4.5/5.0	4.5/5.0	4.6/5.0
Number of students	110	122	76	60

While class reviews and averages only slightly rose, the number of students who got a C or better rose significantly. The ability to show video clips, simulated experiments, and pictures of process equipment seemed to have a more positive effect on underperforming students. When asked, at the end of the term, 74% of all students thought the use of DYKNOW should continue and 55% of the students thought that DYKNOW helped improve their grade. One student said, “I really enjoyed using DYKNOW to take notes. It gave us a basis of what he was going to talk about and then we could add anything else we felt was important.”

Faculty were informed in 2011 that Toshiba was no longer going to make Tablet PCs and that the university was going to focus on a new type of tablet device, the Apple iPad. So DYKNOW will not be supported by the university in the future. Many faculty members who have used DYKNOW are not as enthusiastic about this change, as class management software is currently missing for the Apple iPad. What was clear from the use of DYKNOW is that if technology is going to be used in the classroom, the ability of the instructor to control the content delivered is paramount for success in the classroom. For Universities that continue to have students purchase Tablet PC’s or laptop computers using DYKNOW as a class management software, is a viable option and has proven to aid student learning.

1. Richard M. Felder, Rebecca Brent “Death by PowerPoint”, *Chemical Engineering Education*, 39 (1), 28-29 (2005)
2. <http://www.dyknow.com/educational-software-products/>