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Games for Teaching Information Literacy Skills

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Active Learning Activities

Two hydrogen atoms bumped into each other recently. One said, "Why do you look so sad?" The other responded, "I lost an electron." Concerned, the first one asked "Are you sure?" The other replied, "I'm positive."

Admittedly, this is a silly joke, but it represents a creative way to introduce search terms into a class discussion or simply get a chuckle from students in an information literacy course. The joke is short and can be placed on cover sheets for returned graded assignments. It does not detract from the class, and is one example of humor, which is an active learning technique used as part of the Chemical Information Research Skills course for academic credit taught at the University of Notre Dame. This course is mandatory for sophomore Chemistry/Biochemistry majors.

The original instructor for this course taught two one-credit sections during the spring semesters of 2004 and 2005. Previous course evaluations revealed that while students were for the most part enthusiastic of the class content, the original instructor could see their bored looks during the 40-minute lectures and instructor-led demonstrations. The part the students really enjoyed was the ten minute hands-on section at the end of each class. Moreover, their boredom during the lecture and demonstrations could provide future ammunition for faculty members who failed to see the value of this course.

I was assigned by the original instructor the task of incorporating active learning activities into one of the two weekly literacy skills sections and checking for continuity between the lecture, hands-on demonstration, and assignments. To that end, active learning activities were created for each week's lesson plan. The original instructor taught on Tuesdays without using active learning techniques, while I taught

a section on Thursdays that had the same format and content as the Tuesday section but also had active learning activities. Both sections consisted of twenty-one students and used identical lecture materials and hands-on practice exercises. The active learning activities were integrated into the course curriculum of the second section to reinforce lecture materials and keep students engaged. In the remainder of this article, I review previous research relating to Generation Y characteristics; brain-based educational theory and learning style preferences. I then introduce specific active learning application examples used in the redesigned Chemical Information Research Skills course. Finally, I argue that active learning techniques effectively reduce student boredom and keep students engaged in information literacy classes.

Research

Student boredom does not reflect negatively on the original information literacy instructor. Research shows this is a prevalent pedagogical obstacle. One explanation for boredom is inability to captivate students' attention. Mandatory classes can make students feel like academic hostages, resentful of classes they do not perceive a real need for (Adams, 1985). In 2001, more than thirty percent of libraries offered information literacy credit courses. Unfortunately, studies found that students ranked credit-courses as their least preferred means of getting library instruction, compared with individual instruction conducted at the point of need while students are actively seeking information (Davidson, 2001).

Active learning theorists encourage instructors to consider the motivational context for students during course design. The premise is that students learn best when they feel a need to know. Integrating exercises into the curriculum prompts this need to know. Activities which provide rewards or prizes serve as a motivational force. This new generation of students is characterized as having low thresholds for boredom as well as having short attention spans (Brown, 2002); hence, interaction, group activities, and levity have become essential pedagogical practices. Active learning also addresses distinct styles of thinking. The left and right hemispheres of the brain process information in different ways. People tend to process information using the dominant side of the brain. This dominance is commonly referred to as being either "right-brained" or "left-brained." Left-brain scholastic activities focus on logical thinking, while right-brained activities focus on creativity.

Brain-based educators favor a constructivist, active learning model, which claims that the learning process is enhanced when both sides of the brain are engaged in a balanced manner. Traditional instruction methods usually favor left-brain modes of thinking. While active learning models encourage increased usage of the right-brain, it is not to the exclusion of the left-brain. Active learning activities foster a more whole-brained scholastic experience by using instruction techniques such as adding metaphors, analogies, role playing, visuals, and movement into classes that connect with both sides of the brain (Bruer, 1999). With alternative approaches to instruction using increased group interaction, instructors can essentially get twice the

brain. The onus is on instructors to spark student enthusiasm for learning, as opposed to being dismissive of their expressed boredom.

Brain dominance is related to learning style preferences. Millennials, or Generation Y students aged 17-19, have unique learning style preferences. This generation has an affinity for visual over textual information. Instructors must focus on learning style preferences to maximize instruction. It is no longer adequate to provide "for-their-own-good" instruction. Evolving teaching methods accommodate these changing learning styles and lead to improved student attitudes and performance. Studies show that collaborative activities are ultimately more effective than teacher-centered lectures for Millennials and Generation Y students (McGill, 2004). As opposed to abstract theories and working in isolation, active learning theorists contend that learning must allow students to act on tangible material in social or group settings (Brown, 2003).

Instructors must match their instructional style to their students' learning style (Eom, 2006). Students are intrinsically more motivated to learn when they are taught in concert with their learning style preferences including Visual, Aural, Read/write, and Kinesthetic sensory modalities (Drueke, 1992). There is ample evidence that lectures are ineffective, especially for the new generation of learners. The antiquated "stand-and-deliver, you-will-listen-to-me" approach is not very effective (Manuel, 2002). A mere five percent of lecture material is retained as opposed to fifty percent retention for group discussions. These retention figures served as an impetus for the activities proposed in this article. As a result of growing up with video games and music television, today's students are accustomed to being continually entertained, and this has shaped their expectations for more engaging instruction (Soloway, 1991).

Application

Both sections limited lectures to twenty minutes, thereby allowing thirty minutes for exercises that gave the students hands-on practice searching a database with an instructor available to answer any questions. The students were free to work through the hands-on exercises in a group or by themselves. New millennial teaching theories were used to design the active learning activities. Special care was taken to ensure they complemented rather than detracted from the information being conveyed (Michael, 2003). As part of the course redesign, each active learning activity was tested by a group of volunteers who provided valuable feedback. This testing also provided a quality control measure, ensuring that the activities were not time-consuming, irrelevant, or distracting. Each activity was revised until it clearly met two pre-determined objectives: (1) To make the classes more engaging; and (2) To reinforce the nuances of search strategy techniques for each database such as SciFinder Scholar, Crossfire, and Web of Science.

Crossword puzzles are one example of an activity used to reinforce lecture content and increase student participation in a creative way. The Crossfire Crossword puzzle reiterated the unique Boolean Operators: Near, Next, and Proximity, used to

search the Crossfire database (see Figure 1). Similarly, Copyright Tic Tac Toe emphasizes issues surrounding copyright infringement and academic integrity which are covered in the class lecture material (see Figure 2).

Another group of activities actually simulate the mental processes required in effective search strategies. For instance, the riddle mirrors the need to use synonymous keyword when searching for patents (see Figure 3). The class lecture offers the example of "Velcro" as a term with several antecedents. "The hook and eye," a clothing fastener influenced George de Mestral's Velcro design. Therefore, additional patent information about Velcro can be retrieved by also using the search terms "hook and eye." If the riddle is not easy to solve, there is an unscramble option as an alternate way to get the answer. This alternative was added as a time saving mechanism. Web of Science Word Find is another activity that simulates the thought process required to conduct Cited Authors searches in Web of Science (see Figure 4). This activity requires students to find different spellings of an author's surname in the grid as well as in the database. The Word Find example demonstrates how some spellings of the surname can retrieve zero results while other spellings retrieve nineteen.

In addition to activities, humor was incorporated into the course to reinforce new concepts from the lecture material and infuse a bit of levity to break up the more complex lecture material. Examples include a cartoon created to re-emphasize the ANDNOT Boolean Operator used in the United States Patent and Trademark Office (USPTO) database. Quotations are another technique in the active learning technician's repertoire. Humorous and motivational quotations were added to complex assignment sheets to foster a positive association with the material. Mark Twain's quote was added to the final assignment, and it definitely got the most laughs: "I am glad I did it, partly because it was well worth it, and chiefly because I shall never have to do it again."

The lecture portion for both sections used an opening quote for all but one class. Surprisingly, when the students in the author's section noticed the omission, they demanded to see the quote. The quote was immediately retrieved from the class webpage. Crisis averted! This is an illustration of the enthusiasm generated by adding something extra to classes, no matter how small. Awarding prizes was another way to infuse humor and a little something extra into class. After completion of an exercise sheet the students received a prize. This was a quality control measure to ensure that the more reserved students were equally participatory.

Prizes were a motivational tool to ensure that everyone participated equally and was rewarded equally. Amazingly, students were pleased to receive university pens and Post-It notes as prizes. Other prizes were toy cars, which allowed for a rudimentary imitation of Oprah Winfrey's Big Car Giveaway, when she randomly pointed at audience members exclaiming, "You get a car, you get a car, you get a car," and then the climatic declaration, "Everybody gets a car!" A few weeks later, one student said he still played with his toy car and others said they really loved the

pens. Inexpensive but effective! The author reminded them the real "*treasure*" is not the prizes awarded but rather the "*knowledge*" gained.

A unique challenge is databases constantly add new records. The hands-on exercises were printed on Mondays with a pre-populated number of results, which indicated the correct answer. But by Thursdays the number of results could be higher. For example, if there were only six records retrieved during Tuesday's section, by class on Thursday there could be eighteen records. To resolve this issue, the hands-on exercises were reworded to reflect this possibility, "*If you retrieve six or more results you have the correct answer.*" This was a teaching opportunity to remind students to check databases frequently since new information is often added daily.

Another challenge is to make the games integral to the learning objectives. The key is to think **EDU**-tainment as opposed to **ENTER**-tainment. Academic scholars claim that playing games is good for literacy, problem-solving, and researching. Searching is like a mental game. Playing games and conducting research share characteristics. Both require considerable skill and repetition. Both require dedication and practice. Both have goals that are obtainable through a series of steps. And both can be simultaneously entertaining and rewarding.

Implementation

The only formal assessment tool available for the Chemistry class was the university's standardized Teacher and Course Evaluation (TCE) Form. The TCE evaluations dealt strictly with class content and did not address active learning techniques. The evaluation results are private. Consequently, there was no way to compare evaluations between the section that did not incorporate active learning and the section that did use active learning. However, written responses for the author-led section revealed that the activities were highly regarded by the students. A previously dissenting faculty member who monitored the author's classes admitted being impressed by the active learning activities. Therefore, the overarching goals to both enhance the curriculum and to convince faculty this was a worthwhile class were achieved. The author was able to use the experiences and activities gained from the Chemical Information Research Skills course when she taught the First Year Studies classes.

During the following semester, these activities were modified and used for the First Year Studies. Since there were no relevant evaluations available for the chemistry class, the author created a separate evaluation form to assess the value of active learning techniques used in the First Year Studies classes. After the semester ended, results from one hundred First Year Studies evaluations were tabulated:

- 86% of students agreed the activities were engaging and were not distracting.
- 95% agreed the activities were preferable to a lecture-only format.

Conclusion

Active learning techniques are important pedagogic innovations (Bickman, 2003). The activities used in this Chemical Information Research Skills course can be adapted for general classes (Scholes, 2002). These activities were derived directly from lecture material and hands-on exercises to augment but not replace class lectures or hands-on exercises. The activities reinforced search strategy techniques required for different databases. Clear objectives were expressed, tested and achieved. The activities are purposefully simple. Great care was taken to ensure that the activities themselves were neither time-consuming, nor distracting. It would be inadvisable to ascribe loftier expectations to the aforementioned activities. These activities were a direct result of a specific request from the original instructor for more engaging instructional sessions. Nothing more,- nothing less.

The main advantage of these activities was their ability to keep students interested in the lessons. Student feedback shows there is intrinsic value in simply taking a break from the monotony of a lecture format. As a reflective practitioner, I observed the student's non-verbal and verbal responses to each activity. The students' body language consistently indicated a high interest level. In addition, the students' class participation showed increased involvement. One student's comment on the evaluation sums it up nicely:

"An otherwise boring and painful course was not so boring and painful!"

No matter what we try to convey, if students aren't listening, instructors are not being effective!

Acknowledgement

Appendix

Crossfire crossword (Figure 1)

This is a simple two minute mini-crossword puzzle designed to reinforce the nuanced Boolean Operators the lecture introduced: Near, Next, Proximity.

CROSSFIRE CROSSWORD PUZZLE

										¹ O
		² A	³ N	⁴ D			⁵ N	⁶ E	⁷ A	⁸ R
			⁹ E				¹⁰O			
¹¹P	R	O	X	I	M	I	T	Y		
			T							

ACROSS

2. Finds all search terms listed

5. Both search terms are adjacent to each other but in any order

11. Two search terms must be present, used to search related fields

DOWN

1. Finds synonyms i.e. either happy __ glad

3. 1st search term appears before 2nd term

5. Finds 1st search term without the 2nd term

Figure 1 Crossfire Crossword Puzzle

Copyright - Tic Tac Toe (Figure 2).

Purpose: To reinforce copyright concepts.

How to play: Place an "X" over words that represent items that can be copyrighted.

*Place an "O" over words that represent items that cannot be copyrighted.

*For all the terms that have an "X" over it, the student must list the Copyright holder.
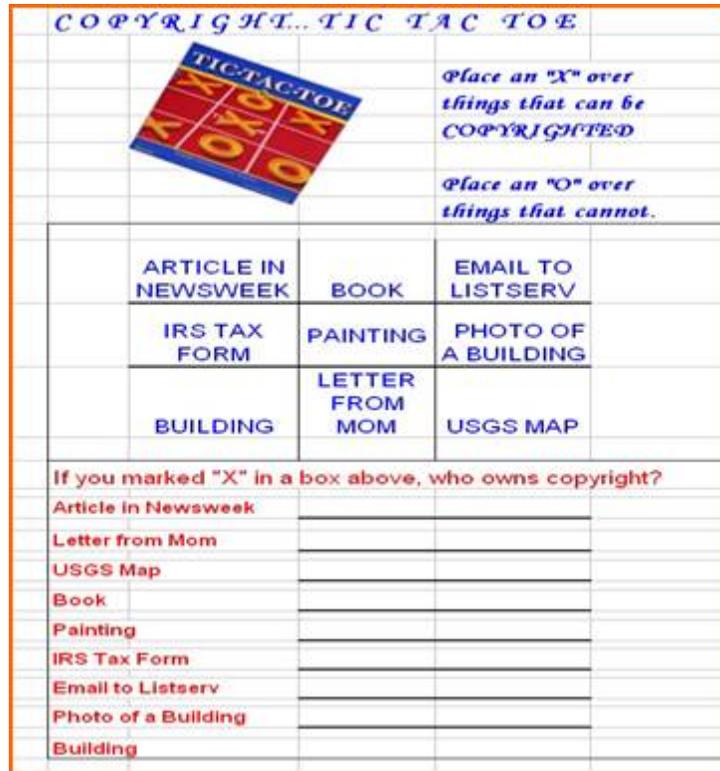
Figure 2 TIC TAC TOE for Copyright

PATENT-ly RID-iculous (Figure 3).

Purpose: To encourage students to use synonyms when searching for patents.

How to play: Students solve the riddle to get the missing portion of the search term/phrase.

*If unable to solve the riddle, unscramble the same term at the bottom.

*Write the term in the blank space provided.

*Search the U.S. Patent and Trademark Office (USPTO) for the search phrase.

*Write down the U.S. Patent number and the Inventor's name.

 *Secondly, unscramble the Word Jumble.

*Write the missing terms in the blank, in this example, "*BIRD DIAPER* "

*Search the U.S. Patent and Trademark Office (USPTO) for the search phrase.

*Write down the U.S. Patent number and the Inventor's name.

Figure 3 Sample Riddle and Word Jumble

Web of Science - Word Find (Figure 4)

Purpose: To emphasize use of variations for hyphenated surname "Cited Author" searches.

How to play: Circle the name variation provided, on the grid at the top.

*Type the surname variations (provided) into Web of Science database.

*Write down the total number of results each variation retrieved.

Sample Surname Variations:

The lecture explained how umlauts in German and Dutch are represented, for example:

g**OE**ppert-mayer or g**Ö**ppert-mayer

Some hyphenated surname spellings variations will yield zero results but different amount of results are retrieved when spelled without a first initial, without a space between the two surnames, or spelled without a hyphen. This is one example: **S.A. Smith-Warner**

Figure 4 Word Find for Web of Science

Cartoon (Figure 5).

Cartoon created to reinforce the unique "*ANDNOT*" Boolean Operator for the United States Patent and Trademark Office (USPTO) database.

Figure 5 Patent Database Cartoon

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