

Teaching Scientific Information Literacy Skills to Veterinary Students: The Missing Link

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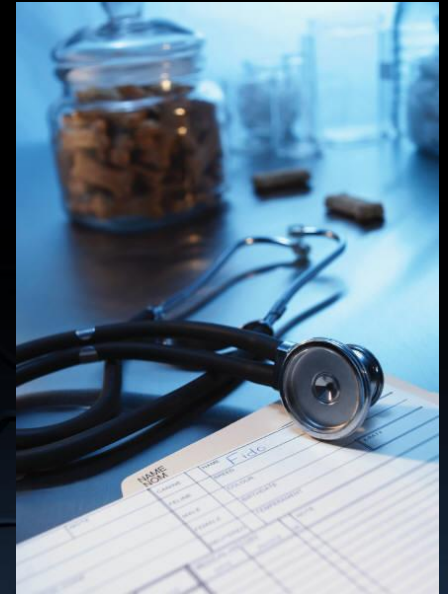
Background

- Health professions students need to be comfortable with scientific literature for clinical decision-making and lifelong continuing education.
- We noticed that our veterinary students were not able to locate and identify relevant articles, or evaluate their quality.



Evidence in Veterinary Medicine

- The volume of high-quality evidence is not as great as other disciplines.
- Veterinary students may need more sophisticated information literacy skills to locate and choose the high quality evidence .



The Opportunity



- Our college went through a curriculum revision to add electives to the curriculum.
- Several of us were excited about the opportunity to develop a course to address these needs.



Judy Klimek (anatomist)

“My first-year students seemed unable to make a judgment about the quality of a paper. They were reluctant to make a statement about quality, and could not explain their reasoning if they did.”



Elizabeth Davis (clinician)



- “From a clinical practice standpoint, it is important that students understand the value of using the published scientific literature to aid in making accurate diagnostic, prognostic and therapeutic decisions.”



Robert Larson (clinician/epidemiologist)

“Learning to find, interpret, and catalogue clinically relevant published literature quickly and efficiently is a critical skill for practicing high-quality medicine in a busy practice.”



Gayle Willard (librarian)

Cindy Logan (former librarian instructor): “I saw 4th year students struggle to find information when they were in the clinics. I was excited when this proactive class came along that would integrate the search process with a critical look at the literature. I hope we have been successful making lifelong learners of our students.”



Who takes the course?

- We have had up to 30 students, but we have capped enrollment at 21.
- Course is open to any veterinary student in the first, second or third year of the curriculum.
 - Mostly first-year students take the course, but second-year students also enroll.



Course Goal:

- Get students comfortable with searching for, reading and interpreting scientific information, in order to inform their clinical practice
- Teach them how to manage information on an ongoing basis



Phase 1

- Learning to search for and save references
 - Introductions and orientation
 - Key veterinary clinical journals and online information sources
 - Data bases and searching
 - RefWorks account



Phase 2

- Experimental design, statistics, and evaluating the evidence
 - Experimental design
 - Evidence Based Medicine and the scientific method
 - Understanding and evaluating statistics
 - Evaluating conclusions presented
 - Evaluating overall manuscript quality
 - The publication process



Phase 3

- Staying current with information, and reference management
 - Critically appraised topics
 - List serves
 - Citation alerts and automated search requests: Web of Science; PubMed
 - Organizing and using references with RefWorks



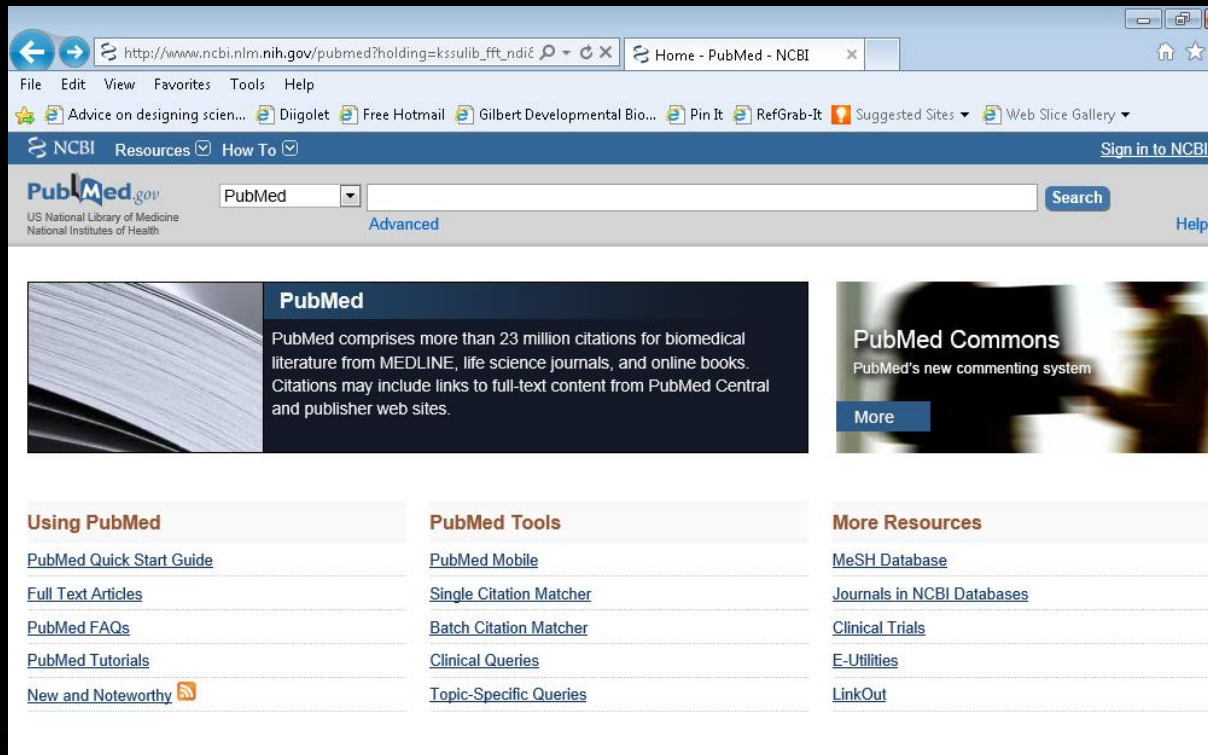
Course Assignments

Activity	Points
Online syllabus quiz	5
3 search assignments @ 10 points	30
3 literature evaluation assignments @ 20 points	60
3 reference management assignments @ 10 points	30
5 message board assignments @ 5 points	25
2 take-home assignments @ 100 points each	200
Total	350



Search Assignment 1

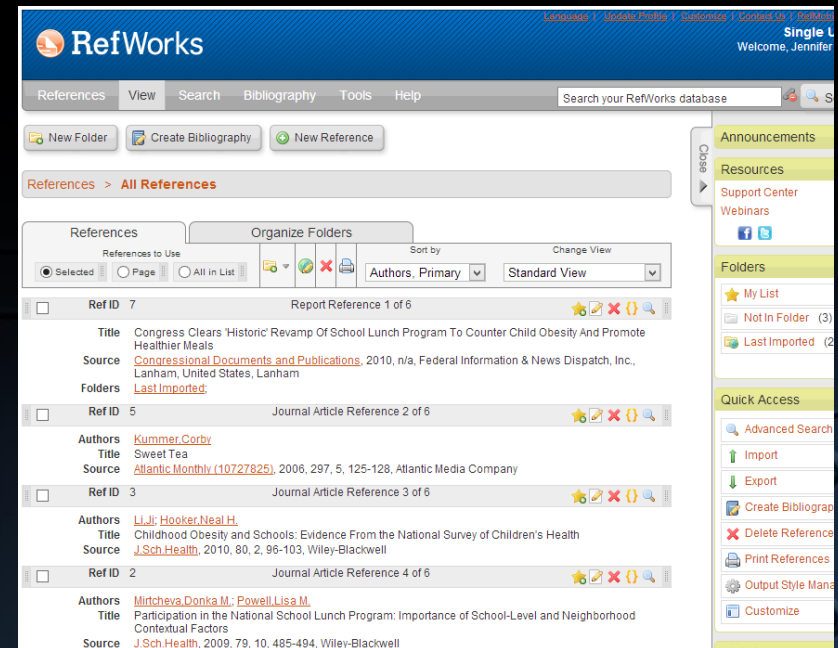
- Create a MyNCBI account.



The screenshot shows the PubMed website interface. At the top, there is a navigation bar with the NCBI logo, "Resources", "How To", and "Sign in to NCBI". Below this is a search bar with "PubMed" selected and a "Search" button. The main content area features a "PubMed" section with a description: "PubMed comprises more than 23 million citations for biomedical literature from MEDLINE, life science journals, and online books. Citations may include links to full-text content from PubMed Central and publisher web sites." To the right is a "PubMed Commons" section with a "More" button. Below these are three columns of links: "Using PubMed" (PubMed Quick Start Guide, Full Text Articles, PubMed FAQs, PubMed Tutorials, New and Noteworthy), "PubMed Tools" (PubMed Mobile, Single Citation Matcher, Batch Citation Matcher, Clinical Queries, Topic-Specific Queries), and "More Resources" (MeSH Database, Journals in NCBI Databases, Clinical Trials, E-Utilities, LinkOut).

Reference Management Assignment 1 (done with search assignments)

- Set up a RefWorks account, and create at least two topics folders.
- After conducting searches, import these references into RefWorks, and file them appropriately.



Search Assignments 2 and 3

- (One before and one after instruction in searching)
- Given a clinical topic, find two relevant articles.
- Make and turn in a record of the search, including:
 - sources of information/search strategy
 - the amount of time the search took
 - your results, and how you chose your articles



Literature Evaluation Assignment 1

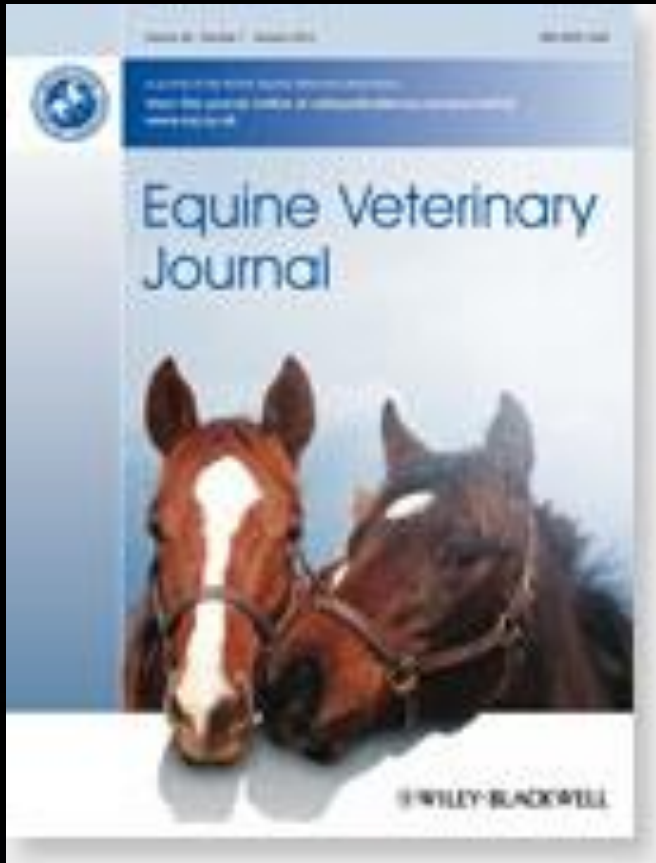
- Locate two articles on any topic, that offer both important and valid conclusions.
- Prepare a short summary of your search strategy, and why those particular articles were selected.



Starting Point



Literature Evaluation Assignments 2 and 3

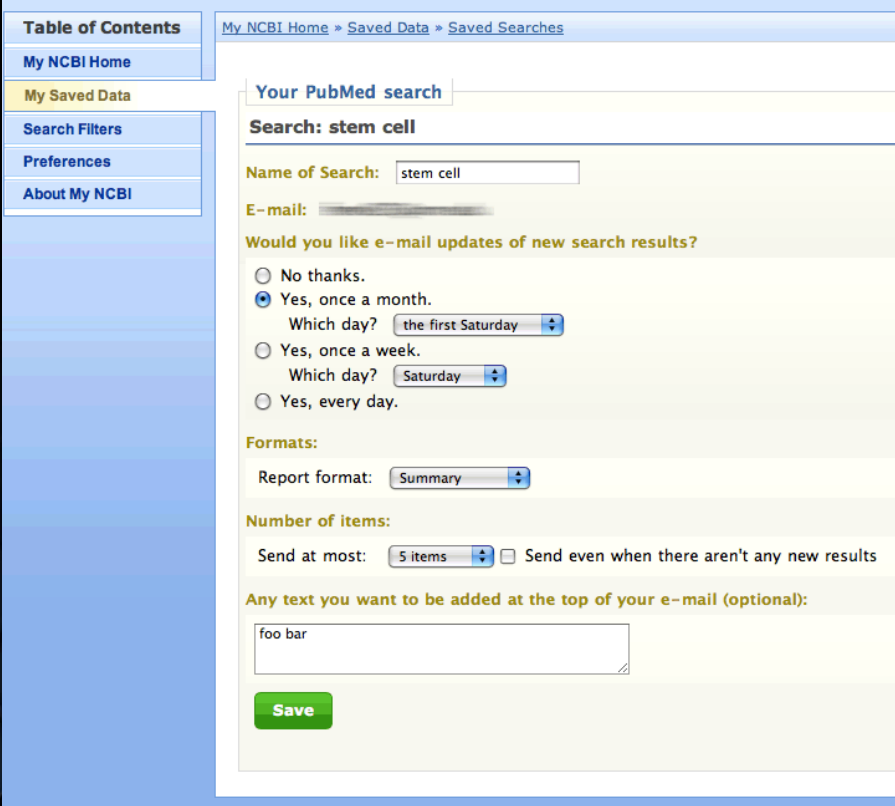


- 1 or 2 articles to read per assignment. (Attempt to give high- and low-quality examples.)
- Answer the provided evaluation questions (in Appendix).



Reference Management Assignment 2

- Set up an automatic search notification for a topics using one of the available databases.



The screenshot shows the 'My Saved Searches' page on the NCBI website. The breadcrumb trail is 'My NCBI Home > Saved Data > Saved Searches'. A left-hand navigation menu includes 'Table of Contents', 'My NCBI Home', 'My Saved Data' (highlighted), 'Search Filters', 'Preferences', and 'About My NCBI'. The main content area is titled 'Your PubMed search' and shows a search named 'stem cell'. The 'Name of Search' field contains 'stem cell'. The 'E-mail' field is redacted. Under 'Would you like e-mail updates of new search results?', the 'Yes, once a month' option is selected, with 'the first Saturday' chosen for the day. The 'Yes, once a week' option is also visible with 'Saturday' chosen. The 'Report format' is set to 'Summary'. The 'Number of items' section shows 'Send at most' set to '5 items' and a checkbox for 'Send even when there aren't any new results' which is unchecked. A text box for 'Any text you want to be added at the top of your e-mail (optional):' contains 'foo bar'. A green 'Save' button is at the bottom.

My NCBI Home > Saved Data > Saved Searches

Your PubMed search

Search: stem cell

Name of Search: stem cell

E-mail: [REDACTED]

Would you like e-mail updates of new search results?

No thanks.

Yes, once a month.
Which day? the first Saturday

Yes, once a week.
Which day? Saturday

Yes, every day.

Formats:

Report format: Summary

Number of items:

Send at most: 5 items Send even when there aren't any new results

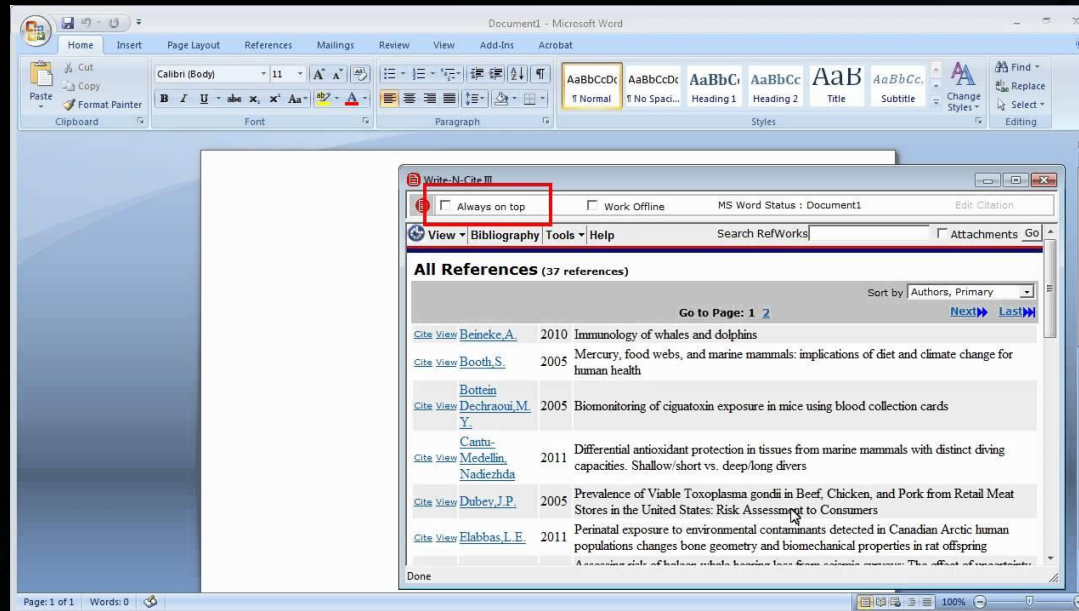
Any text you want to be added at the top of your e-mail (optional):

foo bar

Save

Reference Management Assignment 3

- Compose a brief paper or summary for which you can use some of your saved references as citations. Insert the appropriate citations using Write-n-Cite, and format the document.



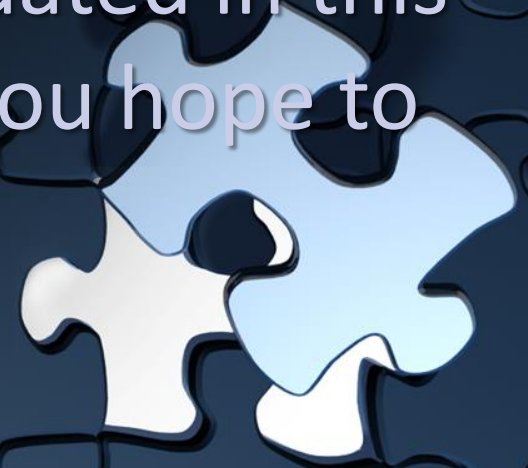
Midterm and Final Assignments

- Integrative take-home assignments that allow utilization of skills attained up to that point.
- Each introduced a “real-life” scenario that would require searching for, identifying, and critiquing research articles.
- Final also incorporated using references saved in RefWorks.
- Grading rubrics developed for each (in Appendix).



Message Board Assignment 1

- Discuss your current level of comfort with finding, evaluating and using veterinary scientific literature. Do you have any previous training or experience in these areas? By what are you intimidated in this regard, if anything? What do you hope to learn from this class?



Message Board Assignment 5

- Reflect on your personal growth as a user of veterinary literature. Comment on your skills in locating and evaluating articles. With what are you still struggling? How can you envision yourself working veterinary scientific literature into your cases here and in future practice settings?



Growth



Message Board Assignments 2-4

- These were assignments to read and comment on articles related to the themes of the course.



Outcomes

- Subjective
 - Our impression; student comments
- Objective (2010)
 - Traditional university course evaluation
 - Pre- and post-surveys to determine confidence in abilities learned from the skills taught in the course. Approval of the Institutional Human Subjects Committee was obtained for this part of the evaluation.
- Objective (2013)
 - First and last message board assignments (not anonymous).



2010 Survey Questions:

For each item, circle the number that best agrees with your confidence in your ability with the particular skill. Use a scale from 1-5, where: 1 = little confidence; 3 = neutral/don't know; 5 = highly confident

1. Using databases through the library.
2. Searching PubMed.
3. Searching for an article on a specific scientific or clinical topic.
4. Understanding the organization of a manuscript or scientific article.
5. Understanding experimental design.



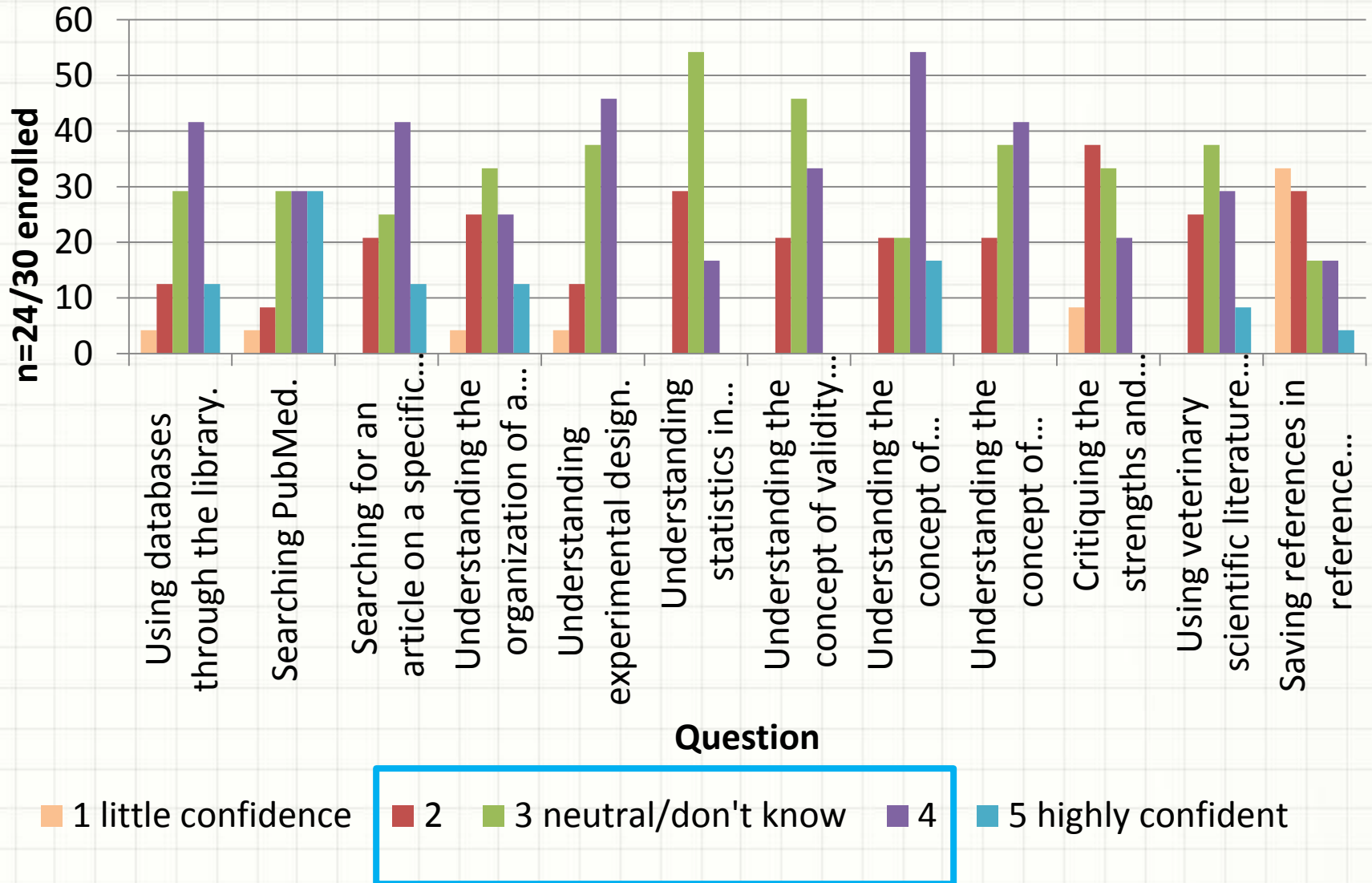
2010 Survey Questions:

6. Understanding statistics in scientific literature.
7. Understanding the concept of validity in a study.
8. Understanding the concept of randomization in a study.
9. Understanding the concept of applicability (relevance) in a study.
10. Critiquing the strengths and weaknesses of a scientific article.
11. Using veterinary scientific literature to form an opinion on a topic.
12. Saving references in reference management software.



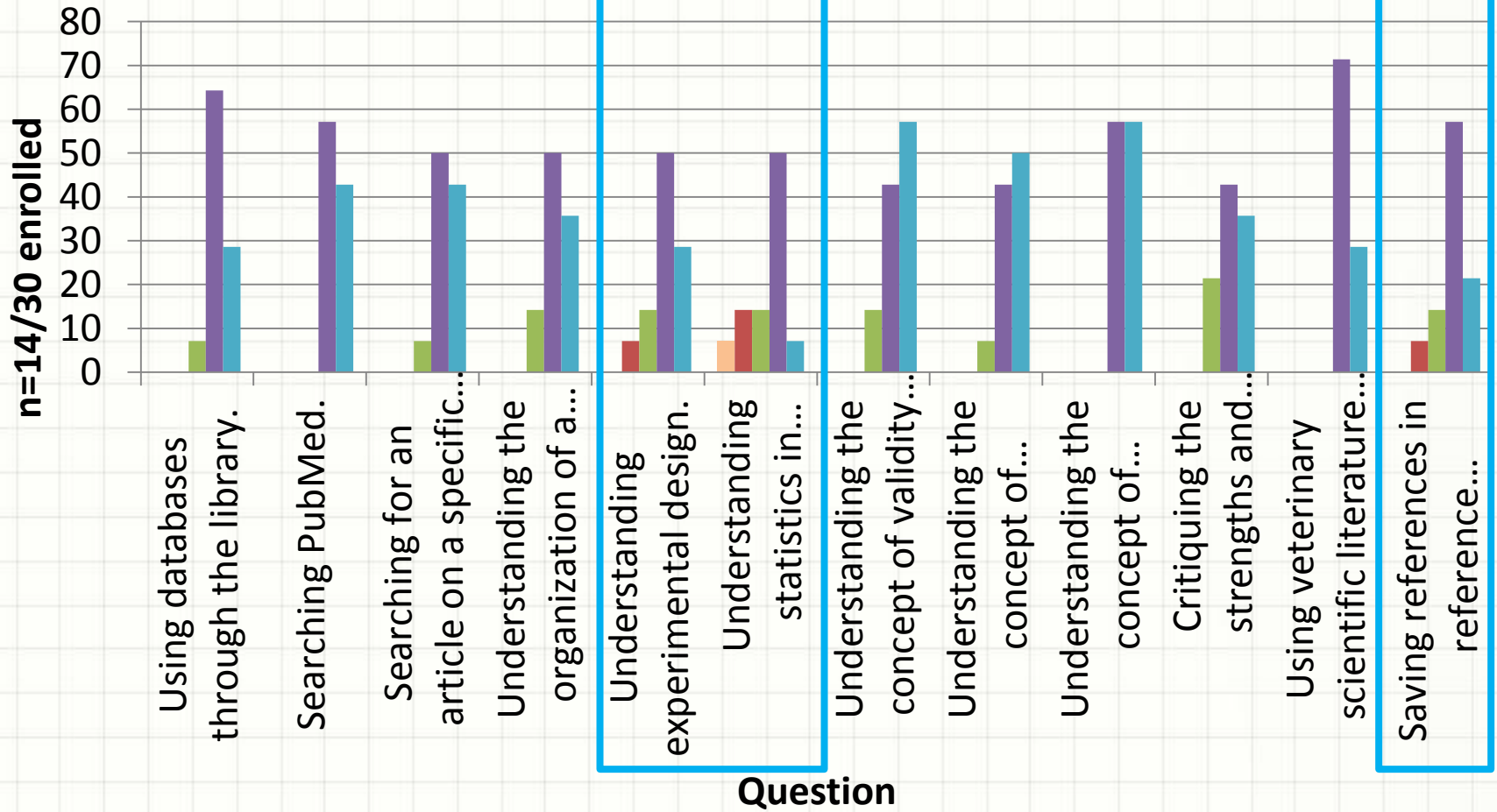
Pre-Course Confidence Survey Results

Percentage of respondents;
n=24/30 enrolled



Post Course Confidence Survey Results

Percentage of respondents;
n=14/30 enrolled



1 little confidence

2

3 neutral/don't know

4

highly confident

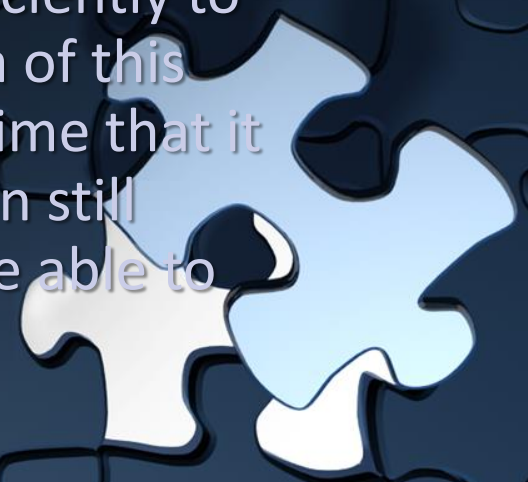
Message Board 1, Student 1

- I have had very little experience with veterinary scientific literature. Because of this lack of exposure, I am a little nervous about this course. However, that is the same reason that I took this course. I am hoping to exit this class at the end of the semester with a newly formed knowledge of how to use veterinary scientific literature.



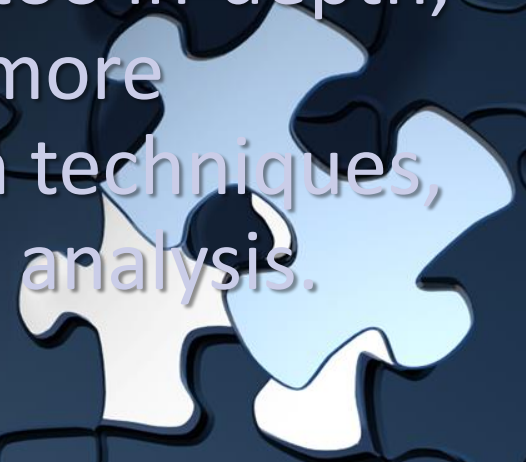
Message Board 5, Student 1

- I am very pleased with everything that I learned in this course. I feel that I have a much better grasp on critically evaluating articles. Prior to this course, I just accepted the results of an article as truth and never thought about all of the various factors that could be considered bias. I believe that this course will allow me to accurately research difficult cases in practice. This will allow me to sift through articles more efficiently to find articles related to my cases. The one area of this course that I still struggle with would be the time that it takes me to search for and locate articles. I can still locate beneficial articles, but I would like to be able to develop better initial search terms.



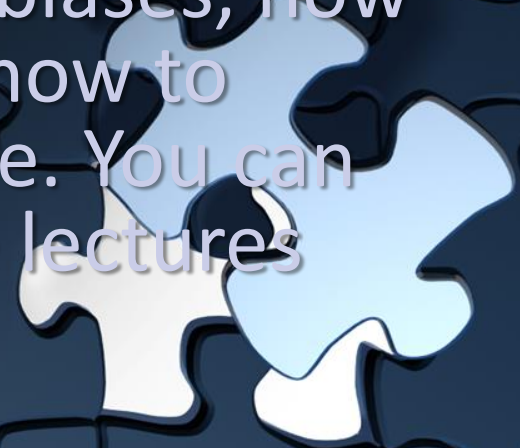
Message Board 1, Student 2

- In general, I find myself able to use various databases efficiently to research scientific literature for information pertaining to my interests, but I have no "training", per say, in any area of scientific literature analysis. My research projects have not been too in-depth, so far, so I am hoping to acquire more advanced knowledge on research techniques, information usage, and statistical analysis.



Message Board 5, Student 2

- I would definitely say the database and reference tools section helped me out the most in this course. Knowing where to find information is paramount in our profession, and I am sure the things taught in this course will come of use sooner than expected. I also enjoyed the lectures on spotting biases, how to analyze articles for truth, and how to perform evidence-based medicine. You can never be too skeptical, and those lectures drove that point home.



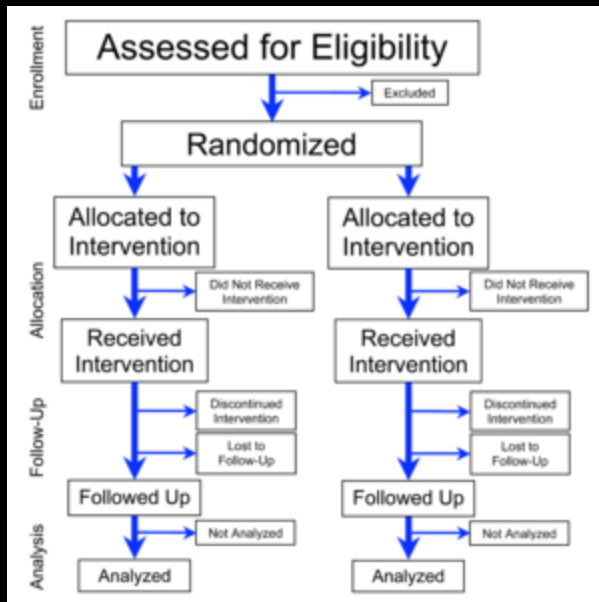
Suggestions for Implementation

- The variety of the team-teaching approach was appreciated.
- Librarian involvement is critical.
- A statistician would have been helpful, because students wanted more guidance in this area.



Suggestions for Implementation

- Do not assume students understand concepts such as:



- Peer-reviewed journals or the peer review process
- Randomization to treatments
- Blinding
- Controls/placebos
- Levels of evidence



Suggestions for Implementation

- Teach reference management software “up front” – they use it enthusiastically.
- Make searches and analyses “real”.
- Search and reference management assignments work well as in-class activities.
- Allow plenty of time for discussion in class.
- Reading written assignments takes a lot of time!

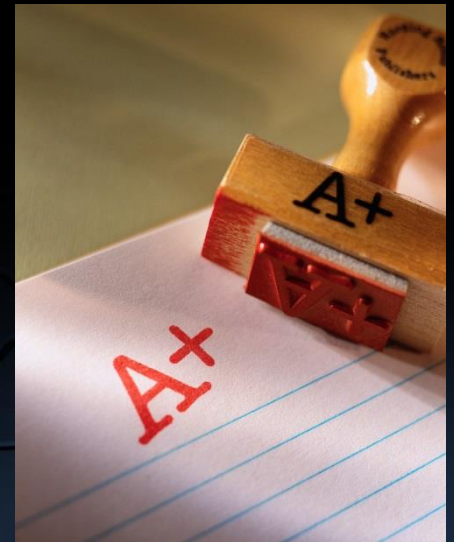


Don't bite off more than students can chew.



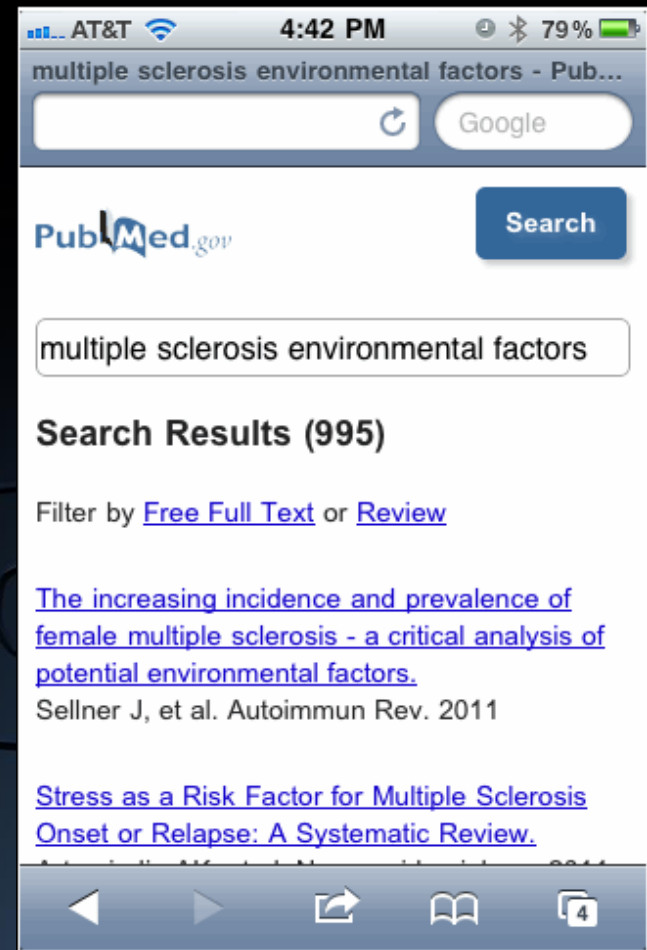
Suggestions for Implementation

- Evaluative questions for articles worked well, and the standard format of the students' work made for easier reading.
- Rubrics for bigger assignments – again, makes for easier comparison and more objective scoring.



Suggestions for Implementation

- Expect students to know how to use search engines, but not necessarily how to design a “good” search.
- Areas in which our students wanted more practice:
 - Statistics
 - Critical analysis (especially in-class discussion)



We Still Need to Determine:

- If the students taking this course are representative of the general population of students, or if there is a selection bias towards a research orientation.
 - Related: did all students get more comfortable with scientific literature during the year, or just those who took this course?



We Still Need to Determine:

- If students who took this course are actually more experienced at using the literature to find evidence relevant to clinic cases in their 4th-year.



We Still Need to Determine:

- How/if other faculty in the college are requiring students to access and use veterinary scientific literature.
- How much the students used the information and skills in this course
 - As they progressed in the curriculum.
 - After they graduated.



Contact me for more information

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Questions?

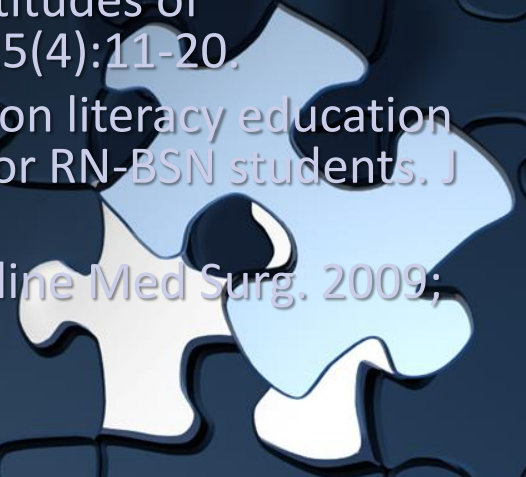


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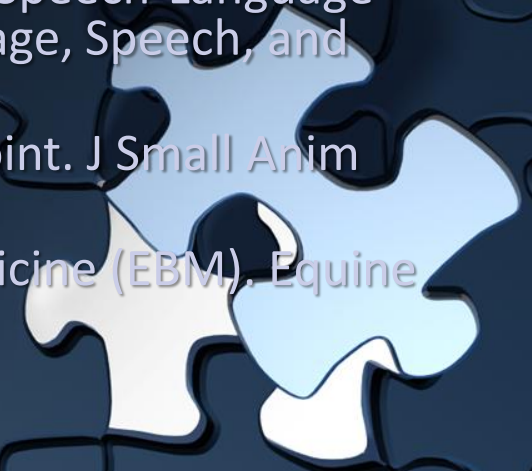
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Evaluative Questions (for every article analysis)

- Give a complete citation for the article.
- What question were the investigators trying to answer?
 - State the hypothesis of the experiment.
 - Describe the sample, the larger population, the sampling method, and the groups used.
 - Why is this an important issue (or is it)?
- What was the study design?
 - Describe the overall design of the study.
 - Was the control appropriate for the question?
 - Do you think the design was appropriate? Why or why not?



Evaluative Questions (for every article analysis)

- What were the results?
 - Summarize the results and whether any findings were statistically significant.
- What did the experimenters conclude about their hypothesis?
 - Did the findings support their hypothesis?
 - Do you agree with their conclusions? Why or why not?
- Did you see any flaws or weaknesses with the study?
- What additional questions did the study raise for you?



Midterm Assignment

AP 780 Practical Use and Interpretation of Veterinary Scientific Literature

Midterm Assignment for 2013

Scenario:

You have joined a research team investigating the efficacy of non-steroidal anti-inflammatory medications (NSAIDs) for use in veterinary patients. Although this class of medication is quite efficacious, there are marked species differences among use in veterinary medicine.

- Some members of your team are working on the clinical efficacy and safety of using NSAIDs in horses. They are interested in determining efficacy and the potential for complications when this class of therapy is used in performance horses.
- Others have been investigating the use of NSAIDs in small animals, not only as an analgesic treatment but as a supplement to chemotherapeutic therapy for certain tumor types.
- A third group is studying the beneficial effects of NSAIDs for pain relief in cattle.

Your mentor has asked you to do a literature review of the work in one of these areas that most interests you, in order to get up to speed with the work being done in the group.

Assignment Part 1 (50 points): literature review

- Search (10 points): Choose one of the areas mentioned above, and search the literature from the last 10 years, using at least two databases, to find experimental studies that are relevant to your topic. You may want to determine names of specific NSAIDs to include in your search. (*Note: in real life this would be somewhat less complex; you could search by author names of your research group members as a starting place.*) Your mentor has asked you to provide a detailed record of the databases selected, your search strategy, including any adjustments you make to the search, and results obtained at every step of the search.
- Select and analyze (40 points): Choose the 2 articles in which you have the most confidence. Provide complete citations, and include copies of the articles you analyze.
 - Using the provided questions, critique each study, identifying its strengths and weaknesses.
 - Also determine what further questions are raised by each study.



Midterm Assignment

Assignment Part 2 (50 points): project proposal

Your mentor asks you to outline a research proposal centered on answering one of the questions you identified in Part 1. Money and/or manpower are no object at this stage of the design – you should describe the “perfect world” scenario, recognizing that reality could dictate that you re-design parts of the study to fit your resources.

- Describe the question you would like to answer, or the hypothesis you would like to prove, and why this is important (10 points).
- Outline in general a proposal for an experiment to answer your question (40 points). Describe at minimum:
 - How you would select subjects.
 - What you would measure to determine the outcome. (Note: No statistics or specific drugs need to be included in your plan at this time.)
 - The steps you would take to minimize bias and maximize internal and external validity.
 - How you would address ethics and animal care issues. All proposed treatments should be humane.

Midterm Assignment Grading Rubric

Required Element	Points	Instructor Comments
Search record	10	
Used at least two databases	3	
Submitted a <i>complete</i> search history	5	
Provide complete citations for chosen articles	2	
Analysis of first experimental study	20	
Answer the analysis questions	15	
Determine further questions raised by study	5	
Analysis of second experimental study	20	
Answer the analysis questions	15	
Determine further questions raised by study	5	
Describe a research question	10	
Outline a research proposal for the question	40	
Subject selection	10	
Outcome measures	10	
Steps to minimize bias/maximize validity	10	
Ethics and animal care issues	10	
Total Points	100	

Final Assignment

AP 780 Practical Use and Interpretation of Veterinary Scientific Literature

Final Assignment 2013

Scenario:

You have recently read an article about a promising new method that has been developed to get tissues to regenerate using extracellular matrix (ECM) as a scaffold for the new tissue. Although much of this work has been done with human medicine in mind, the trials were often in animals, and there has also been some veterinary application of this method. You know from the article you read that the principal developer of this technique is Dr. Steven Badylak (a DVM/MD biomedical researcher), and that he and other researchers at Purdue began this line of inquiry using small intestinal submucosa (SIS) as a vascular graft. They discovered that soon after implantation, the SIS had transformed and had become indistinguishable from arterial tissue. The research has led to the discovery that extracellular matrix can actually attract and influence stem cells, and in humans they have even used it to regenerate, for example, a severed fingertip! How cool is that?!

You are curious to find out how the cells and tissues you have been learning about in microanatomy can be influenced and induced to do new amazing things, and you recognize that this could be the new frontier of wound healing. You decide to do a literature search to find what has been accomplished in this area in the last 15 years. You realize that you now have the skills to search for information on this topic, save your search, get automatic notifications of new publications on that topic, critically evaluate the evidence you find, and even organize and save your references for future use. Your goal is thus to investigate recent research with extracellular matrix and wound healing, critically evaluate the best article you locate, set up a folder in RefWorks to save your citations, and use that folder to create a bibliography and insert citations into a Word document.

Final Assignment

Assignment Part 1 (30 points): Literature Search

- Search the literature from the last 15 years, using at least two databases, to find 10 references with abstracts on this topic. (Remember: Save the references to the clipboard (PubMed) or to the marked records list (CAB), and they can be exported to a file or directly to RefWorks as a group. References can also be sent to RefWorks one at a time if necessary.)
- Keep a **complete** record of your search, including search terms used, changes you made to the search and why, any problems you had with the search, and the number of articles you found at each step.

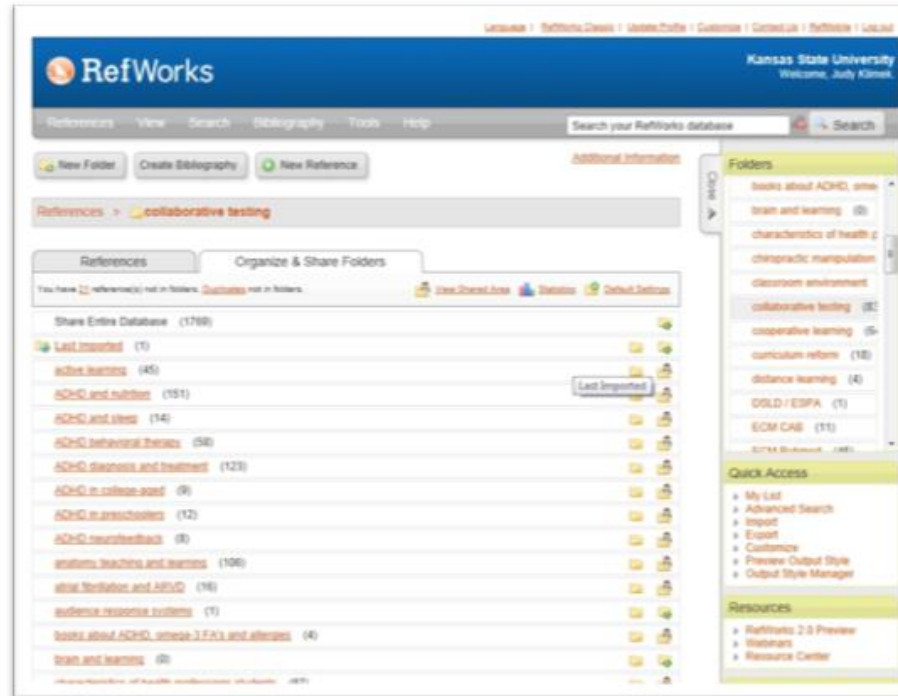
Assignment Part 2 (40 points): Article Analysis

- Choose one exceptional article to read and analyze using the set of questions you were given in class. This article should be the article that you determine offers the best evidence; indicate why you chose this particular article over the others. The article can be either a primary veterinary study, or a study using animals as a preliminary trial for applicability to human medicine.

Final Assignment

Assignment Part 3 (30 points): RefWorks and Write n Cite.

- Create at least one folder in your RefWorks account in which to put your accumulated references. Include a screen capture (example below) that shows this folder with a minimum of 10 references in your Refworks account.



- Create a Word document (1-page or less) that uses Write n Cite to include citations to some or all of the references in your folder for this assignment. This can be as simple as a summary of the article titles you read, or as complex as summarizing some of the concepts of the articles. Format that document, save it, and add the final product to the end of your assignment document.

Final Assignment Grading Rubric.

Required Element	Points	Instructor Comments
1. Search and search record	30	
Used at least two databases	10	
Submitted a <u>complete</u> search history	20	
2. Analysis of one article	40	
Justification of article to analyze	10	
Answered analysis questions	30	
3. RefWorks and Write n Cite	30	
Screenshot of the folder with 10+ citations	15	
Short document that includes citations from assignment folder.	15	
Total Points	100	