"Mark It Up" –Guidelines for Annotation when Processing Scientific Articles

Procedure:

1-Locate a "scientific valid" article that answers your question and print.
2- As you read your a article, mark it up as described in steps 3-10 and be prepared to share your analysis in class. .

3-READ and put a **BOX** around the title of the paper, source of the paper, and authors. IS this a peer reviewed article? If you aren't sure- check out this Oregon State Link. For more characteristics of a scholarly vs. popular vs. trade magazines

4-Find and CIRCLE any subtitles or separate sections within the article.

5-Read the article and underline five unfamiliar terms **OR** 5 terms that you think are important vocabulary for a full understanding of the main points being made by the author. *Look up the definitions of the 5 terms and record these in the* ***margins of the paper*** **OR** ***on the back of the article*** *(placing reference numbers near each term).*

6-Find one of the following within the article: a table OR chart **AND** a figure OR a graph**-[BRACKET]** which visual you chose to evaluate. Be prepared to share your analysis in class: Use post-its on this visual to address: [i]*What is the title of the visual?* [ii]*What is the purpose of the visual?* [iii] *What is the caption for this visual?* [iv]*How does this visual increase the understanding or organization of information on the topic?*

7-**Record (Q) questions** in the margins (record where a light bulb went off or you had an "ah-ha" moment- that this article elicits. This question can come from any section of the article. *In other words what evidence can you demonstrate that while you were reading you were also thinking, reflecting, processing AND* ***applying*** *your life experiences*.

* This is most important part of active reading → ultimately remembering the content of the article itself.

These questions can include **applications** from the content of EdPuzzle videos, homework, case studies, etc. that are learned in and outside of your class(es)- this does NOT need to be restricted in relevance to only the scope of our class.

8-Students identify with 3 different colors of highlighter each of the following

> **E**thos: where does the author appeal to authority and credibility. Where within the text does the speaker/writer try to get you to persuade the reader that they are trustworthy.
> **P**athos: where does the author appeal to the emotions of the audience. Where within the text does the writer try to play on the hopes and dreams, fears or worries, and other beliefs or ideals the audience may have.
> **L**ogos: where does the author appeal to logic and reason. Find points in the video/article where the writer works to 'prove' through the use of facts and rationality to persuade the audience.

9-If you had to explain this study to someone else in 3 sentences. What would you say? **Record this on the back of the article.**

Scoring Rubric

4= exemplary, extraordinary effort demonstrated in processing and marking up the article as listed above
3= proficient, basic level of effort demonstrated and all 10 steps addressed at some level
2= developing, needs more effort to process article, some steps with limited to no evidence of work
1= needs help, student needs more guided practice with article analysis, many steps lacking evidence of work

A Rough Guide to

SPOTTING BAD SCIENCE

Being able to evaluate the evidence behind a scientific claim is important. Being able to recognise bad science reporting, or faults in scientific studies, is equally important. These 12 points will help you separate the science from the pseudoscience.

1. SENSATIONALISED HEADLINES

Article headlines are commonly designed to entice viewers into clicking on and reading the article. At times, they can over-simplify the findings of scientific research. At worst, they sensationalise and misrepresent them.

2. MISINTERPRETED RESULTS

News articles can distort or misinterpret the findings of research for the sake of a good story, whether intentionally or otherwise. If possible, try to read the original research, rather than relying on the article based on it for information.

3. CONFLICTS OF INTEREST

Many companies will employ scientists to carry out and publish research - whilst this doesn't necessarily invalidate the research, it should be analysed with this in mind. Research can also be misrepresented for personal or financial gain.

4. CORRELATION & CAUSATION

Be wary of any confusion of correlation and causation. A correlation between variables doesn't always mean one causes the other. Global warming increased since the 1800s, and pirate numbers decreased, but lack of pirates doesn't cause global warming.

5. UNSUPPORTED CONCLUSIONS

Speculation can often help to drive science forward. However, studies should be clear on the facts their study proves, and which conclusions are as yet unsupported ones. A statement framed by speculative language may require further evidence to confirm.

6. PROBLEMS WITH SAMPLE SIZE

In trials, the smaller a sample size, the lower the confidence in the results from that sample. Conclusions drawn can still be valid, and in some cases small samples are unavoidable, but larger samples often give more representative results.

7. UNREPRESENTATIVE SAMPLES USED

In human trials, subjects are selected that are representative of a larger population. If the sample is different from the population as a whole, then the conclusions from the trial may be biased towards a particular outcome.

8. NO CONTROL GROUP USED

In clinical trials, results from test subjects should be compared to a 'control group' not given the substance being tested. Groups should also be allocated randomly. In general experiments, a control test should be used where all variables are controlled.

9. NO BLIND TESTING USED

To try and prevent bias, subjects should not know if they are in the test or the control group. In 'double blind' testing, even researchers don't know which group subjects are in until after testing. Note, blind testing isn't always feasible, or ethical.

10. SELECTIVE REPORTING OF DATA

Also known as 'cherry picking', this involves selecting data from results which supports the conclusion of the research, whilst ignoring those that do not. If a research paper draws conclusions from a selection of its results, not all, it may be guilty of this.

11. UNREPLICABLE RESULTS

Results should be replicable by independent research, and tested over a wide range of conditions (where possible) to ensure they are consistent. Extraordinary claims require extraordinary evidence - that is, much more than one independent study!

12. NON-PEER REVIEWED MATERIAL

Peer review is an important part of the scientific process. Other scientists appraise and critique studies, before publication in a journal. Research that has not gone through this process is not as reputable, and may be flawed.