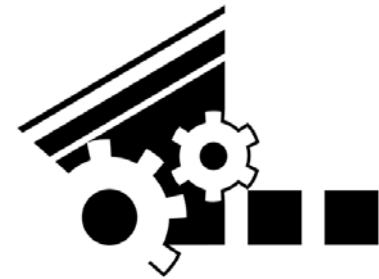
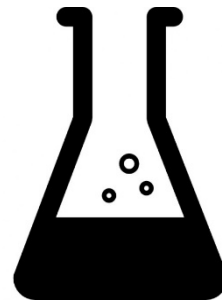


They Write, They Learn:

Successful Multimodal Strategies for Engaging STEM Students



$$E=MC^2$$



Jo Ann Thompson

Sharon Burns

Darwin Church

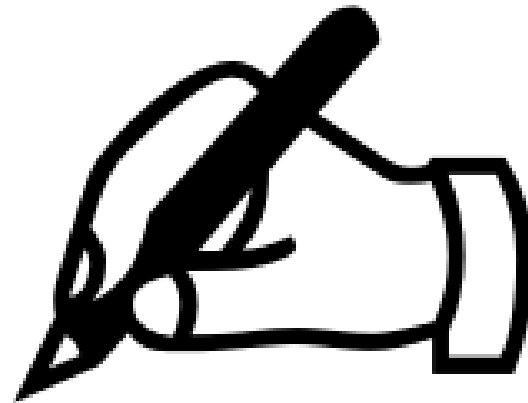
Katie Foran-Mulcahy

Dexter Hulse

Chris Goodman

Bozena Widanski

**Are you involved in multimodal
writing across the curriculum
projects with STEM?**



Project Context and Overview

Jo Ann Thompson, Associate Professor of English

Project Context at Our Institution

What is the need?

- Discontent over students' ability to internalize content
- [Moving beyond a static e-document to a multimodal/interactive project](#)

What are we doing about it?

- Writing in electronic environments = writing in the public space of the internet

Who has been involved?

- Faculty experts in science, technology, math, allied health, and the humanities

Multimodal Writing Across the Curriculum

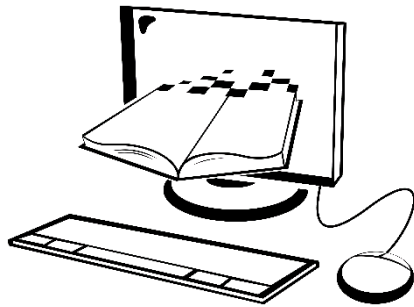
- Electronic poster
- Guided lit search worksheet
- CAD drawing/space rendering
- Original song
- Video
- Online peer review
- Blog
- Collaborative file share

$$E=MC^2$$

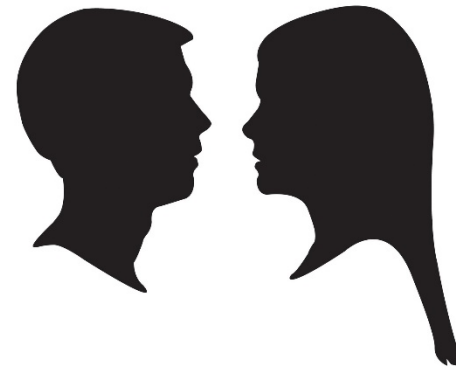
Multimodal Writing in Physics

Darwin Church, Professor of Physics

Writing in Physics



- Essays
- Compositions



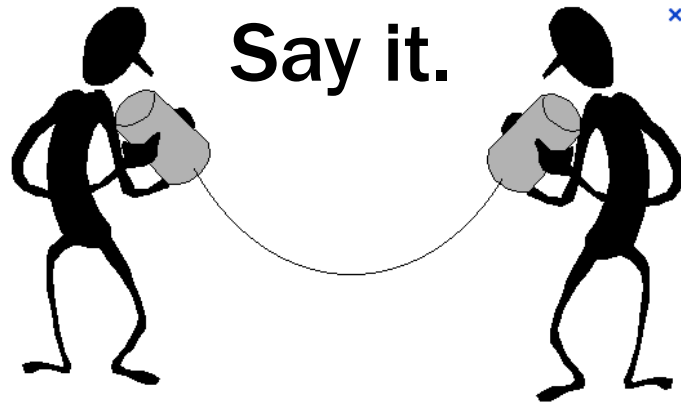
- Sentences
- Paragraphs

Everyday language

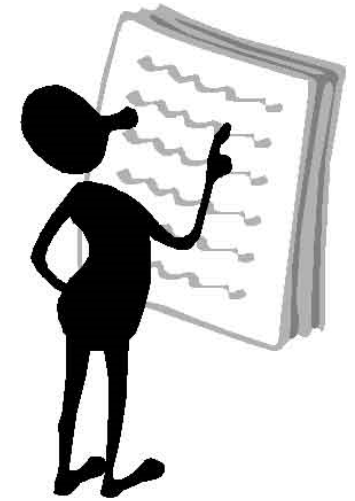
Why do we ask students to write?



Think it.



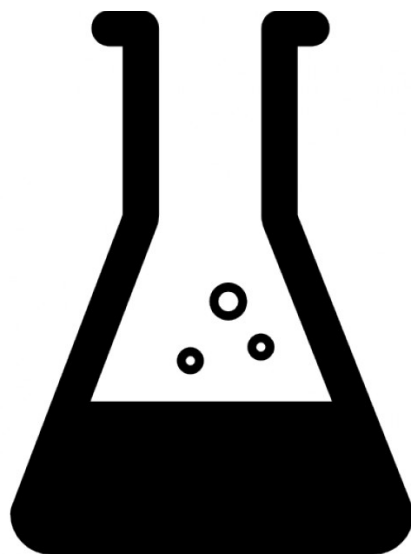
Say it.



Write it.

Results?

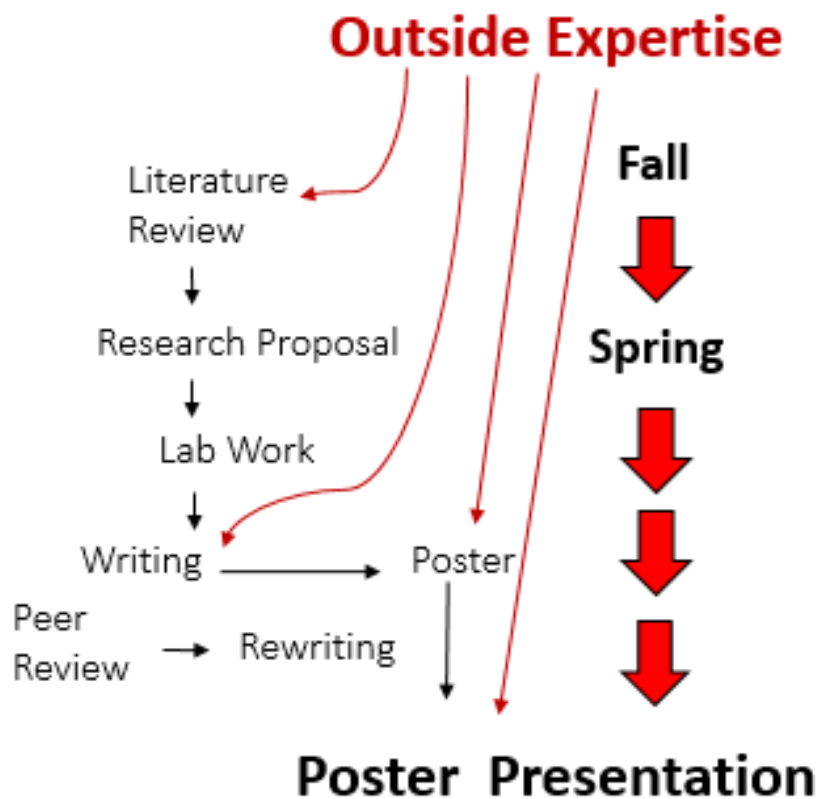
- Improved use of vocabulary in written and verbal explanations
- Improved conceptual understanding
- Improved use of formulas



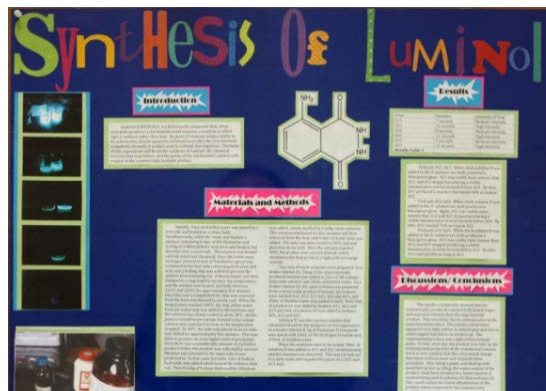
Multimodal Writing in Chemistry

Bozena Widanski, Professor of Chemistry

Organic Chemistry Projects



Status Quo



Caffeine Extraction from Various Common Drinks

Abstract
The reason for conducting an extraction of caffeine from possible beverages was to determine the amount of caffeine in each substance. The beverages used in the experiment were 5-hour Energy, Amp, Lucerne Tea and black coffee. These are substances which most people encounter on a daily basis. It was found that the Lucerne Tea contained the most caffeine and Amp contained the least. The caffeine extracted from the Amp was also found to be the most pure.

Introduction
There are both beneficial and harmful effects that can come as a result of caffeine (Figure 1: Caffeine Molecule). These positive and negative effects include: "increased" alertness, reduced fatigue (1) and "neurological, behavioral, and metabolic" (2), respectively. Caffeine is in the majority of drinks consumed. By observing the amount of caffeine extracted from the each type of drink, consumers will know which drinks are most beneficial or which should be avoided; if caffeine is extracted from the four drinks that are to be tested, which drink will contain the most caffeine?

Methods
The experiment was started by obtaining 100 milliliters (ml) of each substance. The 5-hour Energy shot only contained approximately 50 ml as a 10 ml starter was stirred out with distilled water, for a total volume of 100 ml. The separation technique was carried out for each sample with separatory funnel, sodium carbonate and methylene chloride. The extracts were dried with anhydrous sodium sulfate and then reassociated with a Hensch funnel. The white residue that remained was believed to be caffeine.

Results
The most caffeine was extracted from Lucerne Tea and the least was extracted from the Amp (see Figure 2: Caffeine Extractions). After conducting the TLC on each sample, it was determined that the caffeine extracted from the Amp was the purest from the other extracts (see Table 1: Rf Values of Caffeine Standard vs. Extract). The Rf of both 5-hour Energy and Lucerne Tea were discarded due to possible error.

Conclusions

- Lucerne Tea contained the most caffeine and would be most beneficial to someone seeking the positive effects of caffeine.
- Amp contained the least caffeine and would be least beneficial to someone seeking the positive effects of caffeine.
- The caffeine extracted from the Amp was the most pure, and therefore had the least error.

References
(1) A. Smith, "Food and Chemical Toxicology", Elsevier, 2002, vol. 43, issue 8, pp. 1243-55.
(2) "Health Central Community College. <http://www.seabrookcc.edu/> (accessed October 23, 2012).

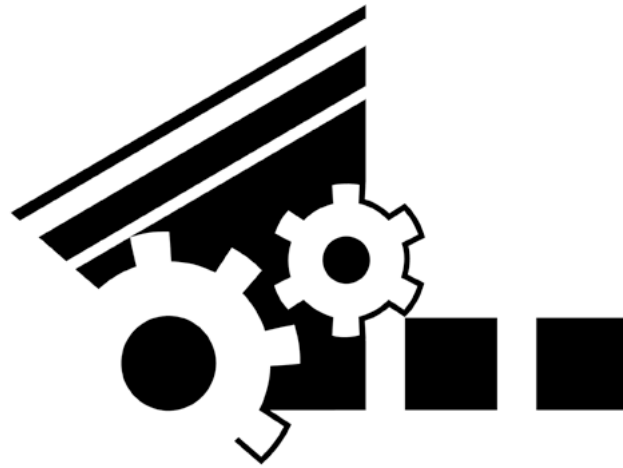
Caffeine Extraction from Various Common Drinks

Figure 2: Caffeine Extractions

UNIVERSITY OF Cincinnati



Outcomes

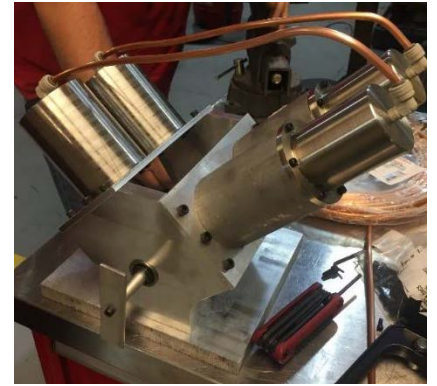
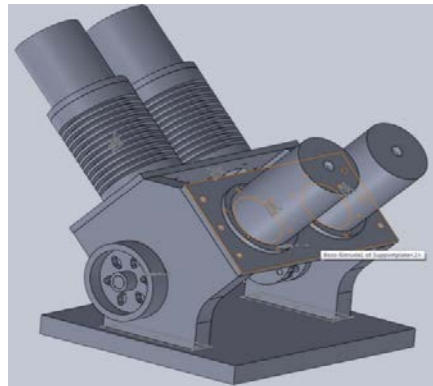


Multimodal Writing in Manufacturing Engineering Technology

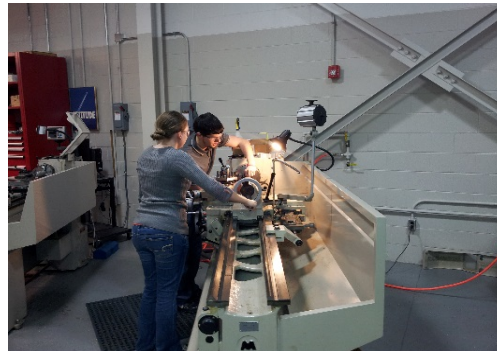
Chris Goodman, Assistant Professor Educator of MET

Manufacturing Engineering Technology

- 2-Year, Associate Degree
- **Sophomore Project Course/ Capstone Project:** design, prototype, manufacture, document assigned project
 - 2015 Project = Chess Sets
 - 2016 Project = Stirling Engines
- **Documentation:**
Typical Documentation (2015) →
Technical Manual (2016)



What's missing from these pictures?



Why collaborate with a technical writing course?

- Success in manufacturing requires effective communication and writing skills
- Communication throughout project AKA project management
- Documentation cannot be an afterthought
- Documentation needs more than technical data – communicate results not just show them



Multimodal Writing in Manufacturing Engineering Technology

Dexter Hulse, Professor of MET

Pre Tech Writing:

Everything is good or bad by comparison.

Previous requirements:

- A three-ring binder with all necessary docs to replicate project
- One person selected/volunteered
- Heavy on process (photos/CAD drawings)
- Documentation at end of course
- Not graded on writing/grammar

Post Tech Writing

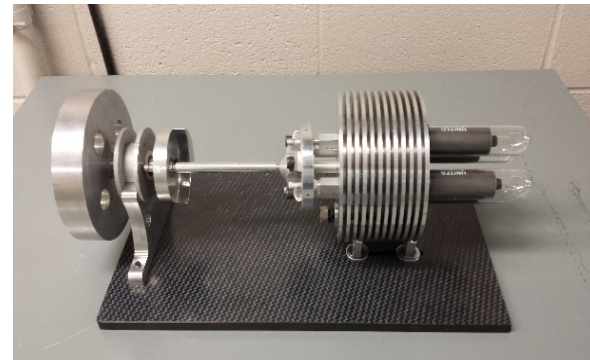
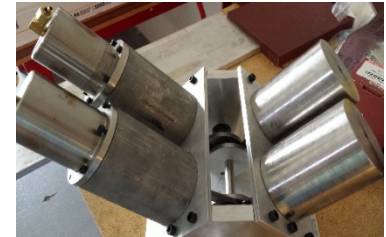
Current requirements:

- Documentation on a progressive basis
- Team documentation during course
- Emphasis on writing supports defined project steps
- Improves critical thinking through detailed explanation of project components
- Promotes audience awareness
- Dual course accountability

Previous projects



Current projects



**What's on the horizon for WAC
collaborations with STEM
faculty?**



Supporting Information Literacy in STEM

Katie Foran-Mulcahy, Director and Associate Librarian

Ideas → Tools

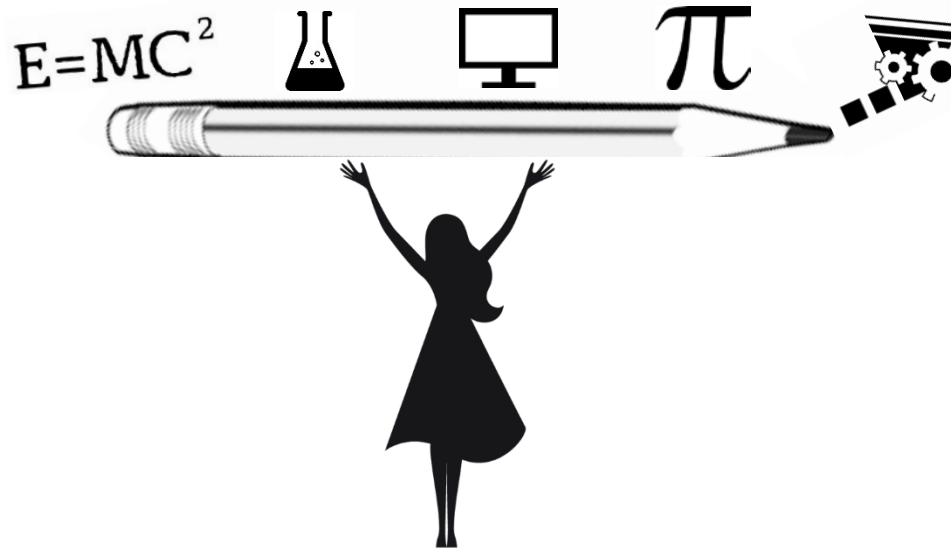


Six Information Literacy Frames (+ writing) in STEM

- Authority is constructed and contextual
- Information creation as a process
- Information has value
- Research as inquiry
- Scholarship as conversation
- Searching as strategic exploration

Librarian as technology teacher

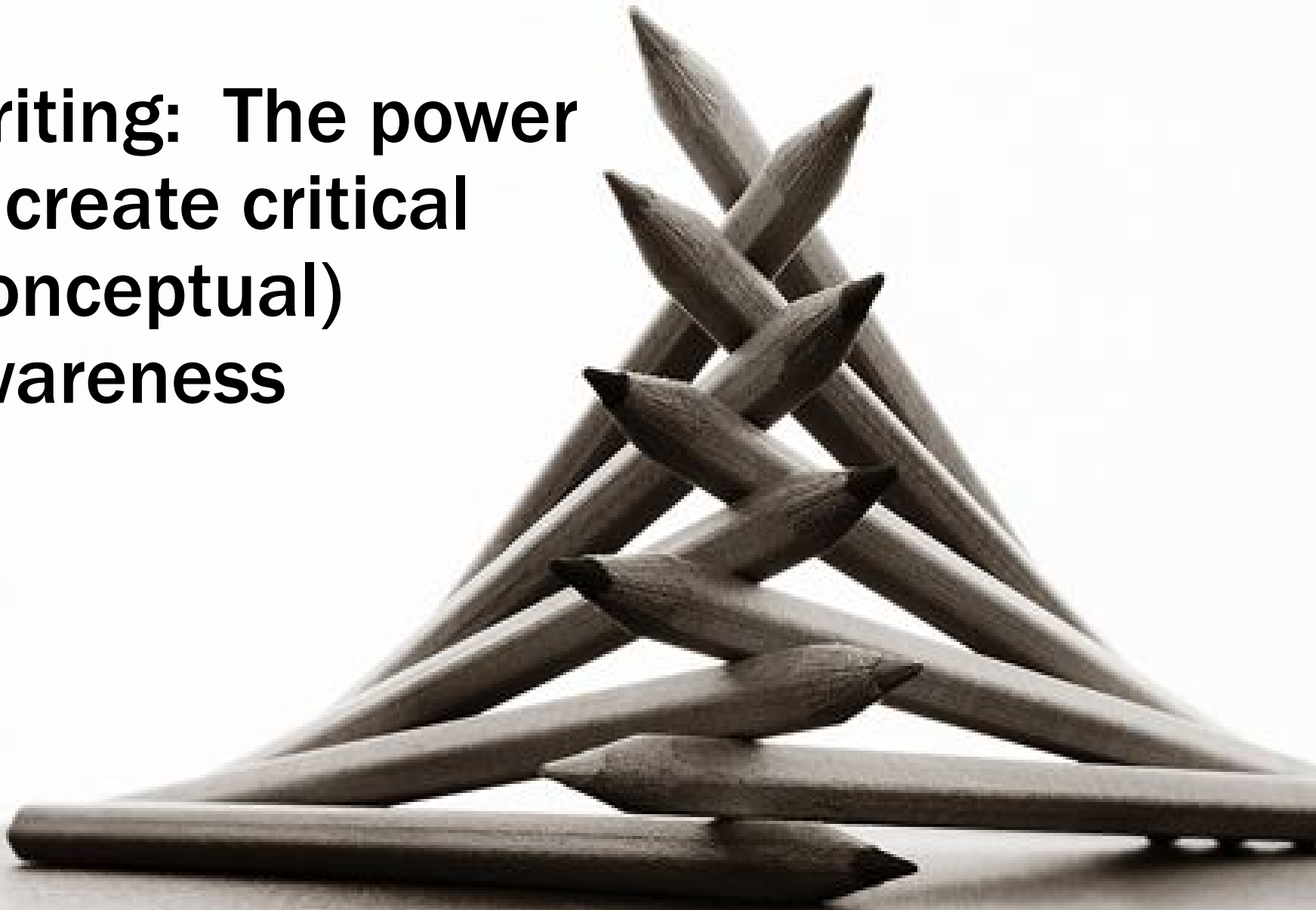
- Demo-ing Google Drive (Docs) as a collaborative writing environment
- [Searching](#) the [chemical/physics](#) literature online
- Creating digital posters in PowerPoint → PDF
- Researching [stirling engines](#) online



Supporting Writing in STEM

Sharon Burns, Associate Professor of English

**Writing: The power
to create critical
(conceptual)
awareness**

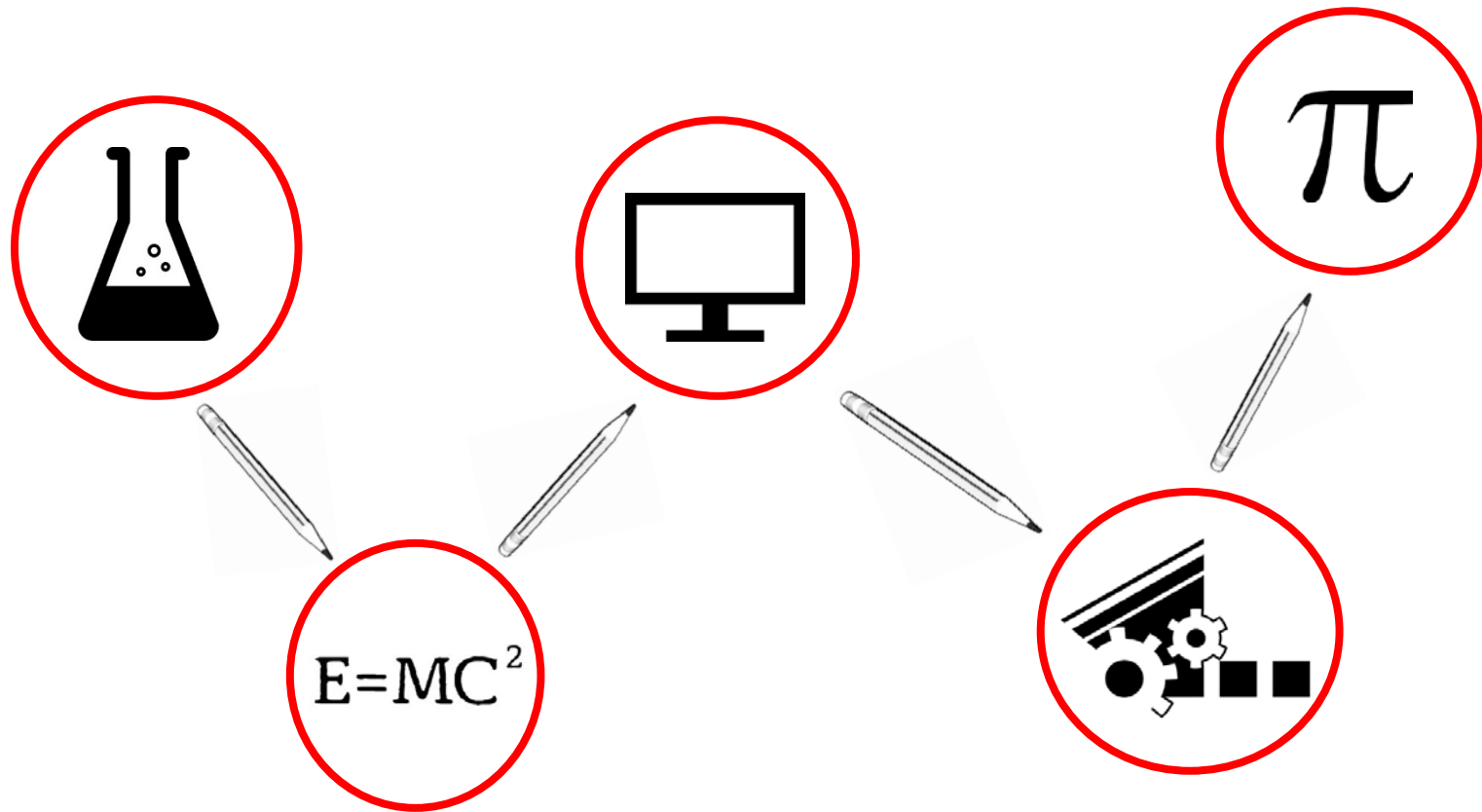




SIMILAR; NOT THE SAME

**WAC expectations
among disciplinary
efforts**

Making connections between disciplinary foci



**Does your institution provide
any unique support systems for
WAC efforts in STEM?**

Works Cited

- Al-Rawahi, Nawar M., and Sulaiman M. Al-Balushi. "The Effect Of Reflective Science Journal Writing On Students' Self-Regulated Learning Strategies." *International Journal Of Environmental & Science Education* 10.3 (2015): 367-379. Education Research Complete. Web. 21 June 2016.
- Anson, Chris M. "My Dinner With Calais." *Pedagogy* 11.3 (2011): 578-590. Education Research Complete. Web. 21 June 2016.
- "Framework for Information Literacy for Higher Education." *Association of College & Research Libraries*. American Library Association. 2 Feb. 2015. Web. 1 June 2016.
- Linkon, Sherry Lee, and Matthew Pavesich. "An Affordance Approach to WAC Development and Sustainability." *WAC Journal* 26 (2015): 22-35. Web. 1 June 2016.
- Reynolds, Julie A., Christopher Thaiss, Wendy Katkin, and Robert Thompson, Jr. "Writing-to-Learn in Undergraduate Science Education: A Community-Based, Conceptually Driven Approach." *Science Life Education* 11:1 (2012): 15-25. Web. 1 June 2016.
- Singh, Chandralekha. "What Every Physics Teacher Should Know About Cognitive Research." *American Association of Physics Teachers Conference Summer Meeting Workshop*. AAPT: Omaha, 2011.