Writing In Physics
An Interdisciplinary Approach

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WASHINGTON, DC

CSAAPT Meeting @ William & Mary – 10 October 2026

Initial Considerations

- Developing writing skills is important
- Writing is a process: not just one assignment or one course
- Great outcomes in terms of applications, presentations, etc.
- All materials of our interdisciplinary effort available online
  - https://github.com/ajvanderhorst/PhysicsCapstoneGW

Revamping a Physics Curriculum

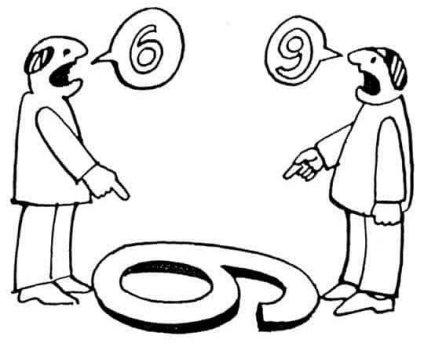
- From individual faculty efforts to curricular change
- Multi-level support: department leadership and professional societies
- Phys21 / J-TUPP report → communication skills
- Multi-year process to revamp the physics curriculum
- Strong focus on written and oral communication



Physics & Writing Context

- Physics Department and University Writing Program in College of Arts & Sciences
- University-wide writing curriculum:
  - First-year course including research project
  - Writing in the Disciplines (WID) courses
- General education curriculum with oral communication
- Research requirement in Physics programs

Different Perspectives



- Physics faculty:
  - How can we improve WID courses in physics?
  - How can we improve writing skills of physics students?
  - How can we address recommendations from the Phys21 report?
- Writing faculty:
  - How can we increase writing and WID in STEM?
  - How can we improve writing pedagogy in STEM?

Interdisciplinary Collaboration

- Pedagogy developed in collaboration between physics and writing faculty → classes taught by physics faculty
- Empower physics faculty to teach writing using threshold concepts: genre, purpose and audience
- Genre: “typified response to a recurring situation” *(Miller 1984)*
- Core principles of writing pedagogy:
  - Create genre and audience awareness
  - Provide tools to navigate new genres

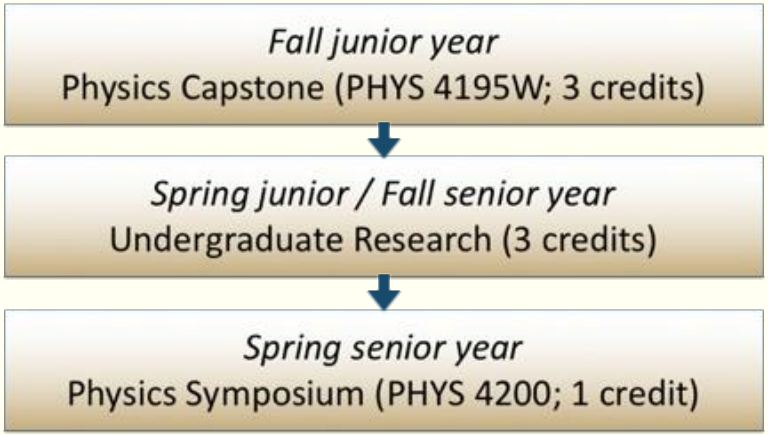
Physics Capstone Experience

- Development of skills for a variety of careers
- Strong focus on written and oral communication
- Collaboration with University Writing Program
- Includes WID and Oral Communications course
- Two courses part of writing-focused curriculum
  - In sequence with Intermediate Lab I course



Physics Capstone Experience

- Final deliverables of course sequence:
  - Research report / paper
  - Poster at College Research Showcase
  - Presentation at Physics Undergraduate Symposium Day



Preparation in Physics Capstone Course

- Learning new writing genres using Collect, Analyze, Try
- Intro to presentations: preparation, purpose, slides, style
- Discussions on research methodology and best practices
- Guest lectures from Career Services and others
- Discussions on implicit bias and JEDI issues

Student quote: *“I think of this class as ‘How to be a Physicist.’”*

Written & Oral Communication



Crucial Component: Peer Feedback

Peer Review of a Paper Abstract (*In-class activity*)

- Identify the strengths and weaknesses of a text, for the purpose of improving it
- Feedback should always be constructive!
- Read your peer's abstract and answer the following questions:
  - Does the abstract's audience match the audience of the journal?
  - Do the abstract's length, organization and format match the genre?
  - What is the main point of the article (in one sentence)?
- Read your peer's abstract again and point out two strengths and two weaknesses
- Discuss your feedback with your peer
- Write down notes on the discussion and give them to the instructor (*for an in-class activity grade*)
- Revise your abstract and submit the final version via Blackboard

Peer Review Activities

- Read the abstract
- Discuss if the abstract meets the expectations of the genre
- Identify & discuss what is most important, interesting or striking
- Identify & discuss what is almost but not quite said
- Discuss the strengths & weaknesses based on the rubric
- Feedback should always be constructive!
- Write down notes on the discussion and give the sheet to the instructor (*for an in-class activity grade*)

Rubrics: Peer Feedback & Grading

Written communication

Content: grasp of physics behind the research in the paper
Motivation: grasp of context and motivation behind the research
Subject Knowledge: confident and focused writing, holding the reader's attention; relevant details enrich writing
Organization: strong beginning, middle and end, with clear transitions and focused closure
Referencing: internal and external referencing effective and complete, using proper standards
Vocabulary: effective and engaging word choice
Voice: distinct, writing is well adapted to the audience
Fluency: variety of sentence structure
Conventions: consistent and effective use of spelling

Oral communication

Content: grasp of physics behind the research in the paper
Motivation: grasp of context and motivation behind the research
Subject Knowledge: answering all questions with explanations and elaboration
Organization: information in logical, interesting sequence which audience can follow
Communication Aids: strongly enhance presentation; font of visuals is readable
Elocution: clear voice and precise pronunciation of terms
Body Language: good position/posture; movements seem fluid
Eye Contact: holding attention with direct eye contact
Enthusiasm: strong, positive feeling about topic

Final Considerations

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