

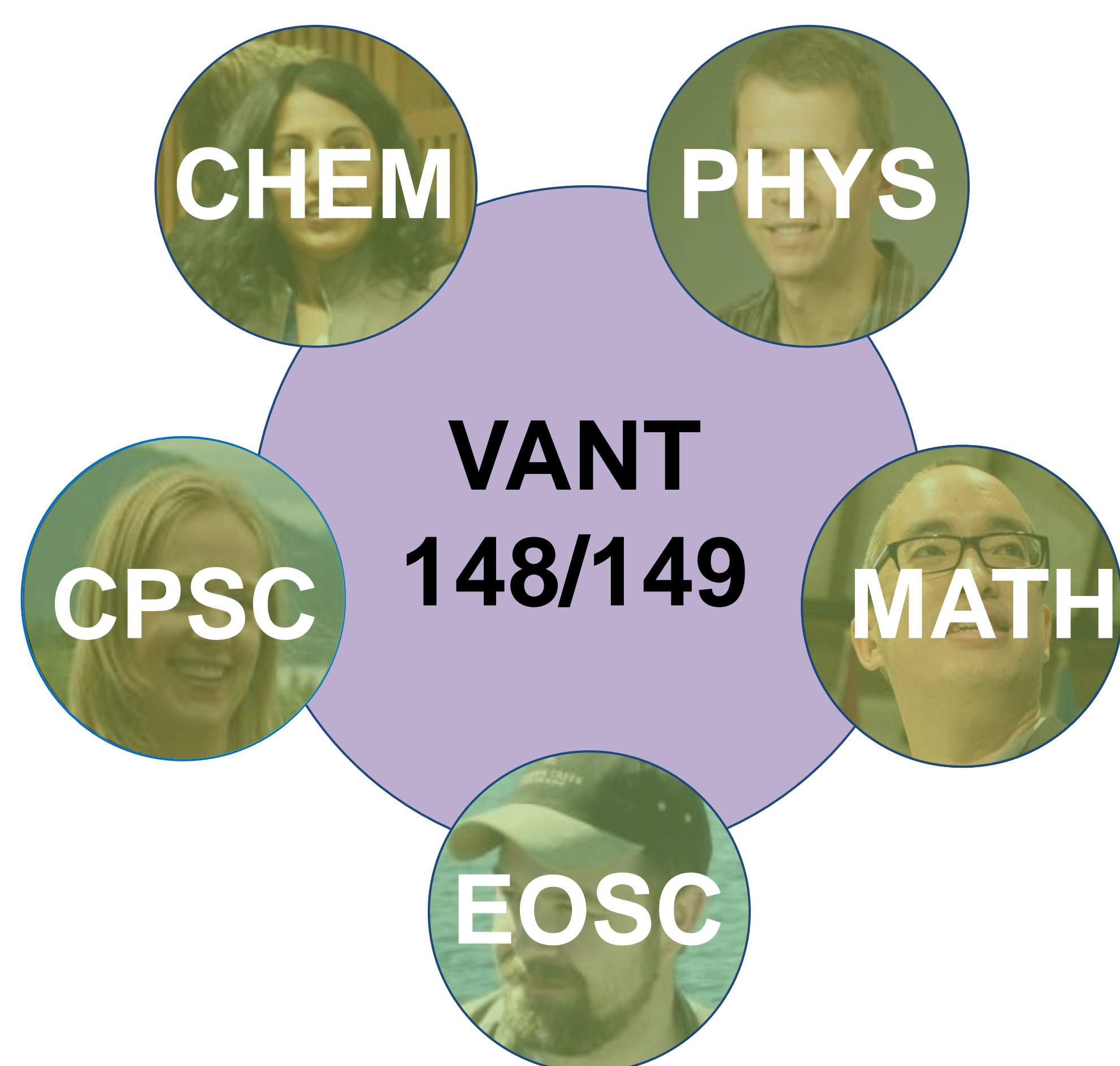
The development and delivery of research project courses for first-year international science students

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Context and background

Vantage One Science stream

- about 100 international, English-as-an-additional-language (EAL) students



VANT 148/149

- 5-member teaching team
- 3 terms, 11 months, 3 credits
- currently in its third iteration
- "...in which you explore scientific and mathematical research topics and approaches, carry out research projects and present them to your peers"

Iteration 1

Course Goals

- Term 1: identify features of a good research **question**
- Term 2: write a **proposal**
- Term 3: carry out and present **research**

Course Structure

- Biweekly **lectures** with 100 students, **seminars** with 25 students, and **small group meetings** with 2-4 students
- Each instructor was involved in all activities

Course Activities

- Term 1: **measurement project**
 - a) attempt to measure something
 - b) discuss the results, refine the question, and repeat
- Term 2: **engage with literature**
 - a) summarize selected entry-level research papers
 - b) write a research question and do a literature review
 - c) write a research proposal
- Term 3: **do research and present it**
 - a) carry out the research proposed in Term 2
 - b) write up the research using a template
 - c) give a low-stakes oral or poster presentation

Instructor Observations and Reflections

- Successful activities
- Less successful activities
- Overall observations:
 - a) the course was too open-ended
 - b) templates are extremely helpful for novice researchers
 - c) significant research is difficult without a serious amount of content knowledge

Instructor-Driven Changes

- **Remove** the emphasis on research literature
- **Remove** the requirement of originality
- **Provide** a list of possible research questions
- **Provide** clear examples of how research is carried out
- **Reformat** the course structure and instructor load

Iteration 2

Course Goals

- Term 1 and 2: do disciplinary "**guided research**", and write a **proposal**
- Term 3: carry out and present **research**

Course Structure

- Term 1 and 2: **modules** consisting of a pre-assignment, lecture, post-assignment and office hours with 100 students
- Term 3: **small group meetings** with 2-4 students
- Each instructor was involved in only some activities

Course Activities

- Term 1 and 2: **do guided research**
 - a) do guided discipline-specific research assignments
 - b) write a research question with guidance
 - c) write a research proposal
- Term 3: **do research and present it**
 - a) carry out the research proposed in Term 2
 - b) write up the research using a template
 - c) give a low-stakes oral or poster presentation

Instructor Observations and Reflections

- Minor improvements in research, and significant gains in all other aspects

Student Observations and Reflections

- **What activity was:**
 - most helpful?** 64% stated: the small group meetings with 2-4 students
 - least helpful?** 61% stated: the large lectures
- **What did you most enjoy about VANT 148?**
 1. learning more about a subject that is an extension of class
 2. having fun doing my own research and finding my interests
 3. working with my professors
- **What aspect of VANT 148 did you find most difficult?**
 1. finding a good question in order to get started in research
 2. homework requiring learning outside of class
 3. academic writing in the course

Student-Driven Changes

- **Start right away** with mentorship-type activities in small research groups
- **Different goals for different students:** only some students are ready for original research
- Recognize that **without the foundation of content knowledge, guided research is pretty good**

Lessons Learned

Focus on guided research and mentorship, provide clear structure, and go modular