Teaching in the Vantage One Science Program

Sharing Our Curricular and Pedagogical Insights from Teaching English Language Learners

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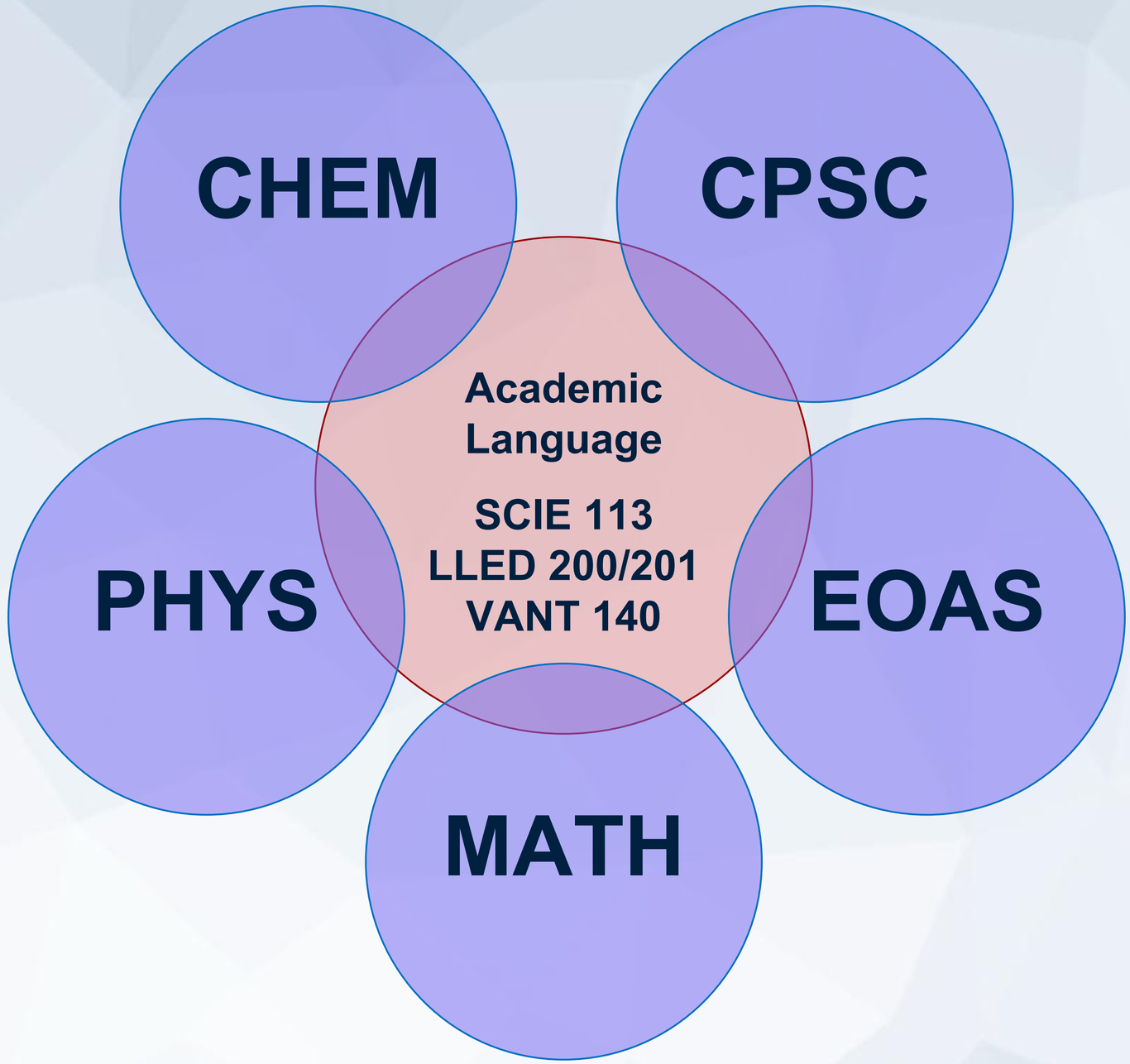
Outline

- Introduction to Vantage and each other
- Case studies
  - Note-taking and summaries in active learning classes
  - Resources to support language learners
  - Activities to encourage talking about course concepts
  - Asynchronous pedagogy and deliberate practice
- We have planned break-out sessions, but please feel free to contribute at any time

A space for innovation

- 34 faculty members and 12 staff
  - 15 academic departments
  - 4 faculties
  - 4 student services units
- Highlights
  - Teaching collaborations
  - Flexible learning
  - Student research projects with faculty mentors
  - Dual campus experiences

Vantage One Science



Vantage One Science

CHEM

CPSC

PHYS

Academic Language

SCIE 113
LLED 200/201
VANT 140

EOAS

MATH

Our unique context

- A cohort of small classes
- A student body consisting of all English Language Learners
- An interdisciplinary team of teaching-focused faculty members
- A close relationship with the Vantage Academic English Program

What is your department and role at UBC (or beyond)?

Small things matter...

- Explicit, detailed, written instructions
- A clear, consistent plagiarism policy with concrete examples
- Explicit attention to group work and communication
- Clumped activities to minimize the number and size of transitions

What is working in your department or classes to support culturally and linguistically diverse students?

What challenges have you faced?

Case 1: CPSC 110

- Introductory Computer Science
  - Active learning strategies
  - 3 hours of lecture and 3 hours of lab per week
- In Direct Entry
  - Large sections with 1 instructor and 1 TA/80 students
- In Vantage One
  - Small sections (<75) with 1 TA/30 students
  - Additional 1 hour of “content tutorial” and 1 hour of “language tutorial” per week

Case 1: CPSC 110

- Concern: Students have difficulty taking effective notes in class
  - We spend a lot of time solving problems
  - Students solve them on their own or copy down the solutions, but often miss the key points

Case 1: CPSC 110

- Current strategy: After class, each instructor posts a summary, including meta-comments, to the discussion forum
- Proposed strategy: In-class TA takes notes and shares them with the class -- the TA knows what to listen for, and can help the students capture important points

Case 2: SCIE 113

- Science communication & argumentation
  - Active learning strategies
  - 3 hours of seminars per week
  - Bi-weekly Science and Society speaker series
  - Very small sections (<25) with 1 TA and 1 instructor
- In Vantage One
  - Additional 1 hour of “language tutorial” per week

Case 2: SCIE 113

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  - Lack of study materials
  - Not enough support for English Language Learners

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  - Inclusion of guided worksheets

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- In class, students completed a worksheet to guide their group discussion
- After class, a summary of students' main ideas was posted on Connect

Class 17: English names and titles

Attached Files: 113 Liz's family worksheet answers.pdf (326.379 KB)

We completed a worksheet about Liz's family, figuring out which titles to use (Mr./Ms./Dr.) and how to cite or reference the names of the people in Liz's fa

The answers to the worksheet are attached here.

Class 17: Summary of the strengths/shortcomings of observations/experiments & models/mathematical relationships

Class 21: Using Headings in Writing and Your Term Paper

Attached Files: Lesson 21 SCIE 113 Introduction to Headings.pdf (152.802 KB)

We used this handout in class today when we thought about why we have headings, what makes a good heading, and the types of headings that you ca

Class 22: Examples of Basic and Applied Research

Attached Files: SCI 113 VO3 Examples of Basic and Applied Research.pdf (35.319 MB)

Here is the handout with the examples of basic and applied scientific research we talked about in class today.

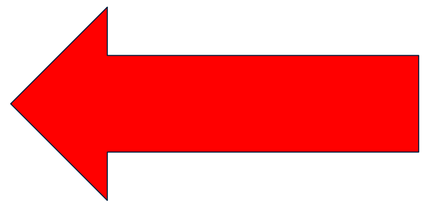
You can also check out this website for some information about the research and testing NASA is doing on fires in space: http://www.wired.co.uk/news/a

This website has more information about the giant wave tank: http://www.bbc.com/news/science-environment-27702506

Class 22: Strengths and Limitations of Applied and Basic Scientific Research

Attached Files: SCI 113 V03 Strengths and Limitations -- Applied and Basic Scientific Research.pdf (53.021 KB)

This is the summary of work you did in class.



SCI 113 V03 Applied and Basic Scientific Research: Strengths and Limitations

Applied Research: Strengths
-it solves actual problems
-it is practical
-it creates jobs
-it can be used in many areas
-it helps society develop and improve
-it is easier than basic research, because it is focused on a specific topic and has clear goals
-it can be used to verify and improve basic research, and to investigate basic scientific concepts more deeply
-it is faster than basic research
-it is immediately useful
-it is profitable

Applied Research: Limitations
-it may not be based on the underlying scientific principles of a situation, so it may be imprecise or have error factors
-it may require scientific knowledge which we do not have yet
-the findings are limited to the specific topic area (but maybe further research can discover if the findings can be applied to other areas?)
-it takes more money and effort to conduct than basic research
-it requires technology and basic research to succeed
-the consequences can be harmful to society if scientists are not careful to think about the risks of the technology or the research
-may waste a lot of money if it doesn't work
-it will only be used in areas that scientists think will make money and directly benefit people
-it is not beneficial in the long-term
-it only benefits a small group of people, not all of humanity
-it does not align with the Nature of Science (objective, creative, always changing, etc.)

Basic Research: Strengths
-can lead to big, unexpected, interesting discoveries
-helps us gain knowledge about the world and satisfy our curiousity
-lots of freedom in choice of topic area
-the findings can be used for applied research – without basic science, there would be no way to do applied research
-there are few issues about commercialization and profits
-it is cheaper than applied research
-allows scientists to explore and develop theories
-it is "cool" because the discoveries are so exciting
-opportunities for innovation and advancing science

Basic Research: Limitations
-it is slow
-it often does not have an obviously useful/practical or profitable result
-it may be seen as wasting money and time
-it does not directly impact everyday life
-it gets less funding (but this could change?)
-it might seem too abstract or too general
-it might create hypotheses that turn out to be wrong
-it can be difficult to do in some cases, such as doing research in deep space, or doing research that some people think is unethical

Case 2: SCIE 113

- Concerns:
  - Lack of study materials
  - Not enough support for English Language Learners
- Vantage approach:
  - Inclusion of guided worksheets
  - VANT 140 course and language workshops

Case 2: SCIE 113

- VANT 140
  - English for Academic Purposes
  - 1 hour per week
- Language workshops & resources
  - Made available to students, instructors, and TAs in Direct Entry SCIE 113
  - Worksheets on plagiarism, academic vocabulary, outlining, and paraphrasing

Have you experienced similar issues? How are you addressing them?

Do any of our strategies apply to your context?

Case 3: MATH 100/101

- Differential and integral calculus
- The initial insight
  - Direct Entry students are computationally weak and creatively overconfident
  - Vantage One students are computationally strong and creatively underconfident

Case 3: MATH 100/101

- In Direct Entry
  - The main goal is computational competence
  - Lectures: 3 hours per week
  - Assignments: 20 WeBWorK questions per week
  - Office hours: 2 hours per week

Case 3: MATH 100/101

- In Vantage One
  - "Lectures":

MON	TUE	WED	FRI
Lecture	Workshop	Recitation	Recitation
Instructor	UTA	GTA	GTA
~80	~20	~20	~20

  - Assignments: 10 WeBWorK questions and 3 written questions, including a "reflection question", per week
  - Office hours: 4 per week, including "concept sessions"

Case 3: MATH 100/101

- An example of a reflection question
  - When calculating integrals using … the method of substitution, it is challenging to explain why a particular substitution is made, other than to say “It works”.... On your UBC Blog, give three tips ....
- Why we like reflection questions
  - Students have to describe the moves between the levels of Bloom’s taxonomy that they are asked to make on their assignments

Case 3: MATH 100/101

- Concept sessions
  - 30 minutes before “regular” office hours
  - The instructor, a GTA, and a UTA are present
  - The only rule: *You can’t ask about the homework*
- Why we like the concept sessions
  - There’s more to life than homework
  - The maximum norm is small
  - Everyone needs to think out loud

Case 3: MATH 100/101

- The original focus was “language”
- The eventual focus was “content”
- The message to students: What you think is important
  - Reflections ask them to describe what they think
  - Concept sessions ask them to expand what they think

What do reflection questions and concept sessions look like in your unit?

Can these work in an interdisciplinary course?

Case 4: Vantage Physics

- In the PHYS 117 class in 2014W
  - 98% attendance over the first six weeks
  - High engagement: Little to no use of social media, work from other courses, video or other distractions beyond brief texts
  - High completion rate of homework and reading quizzes (at start of class; students are on time)

Case 4: Vantage Physics

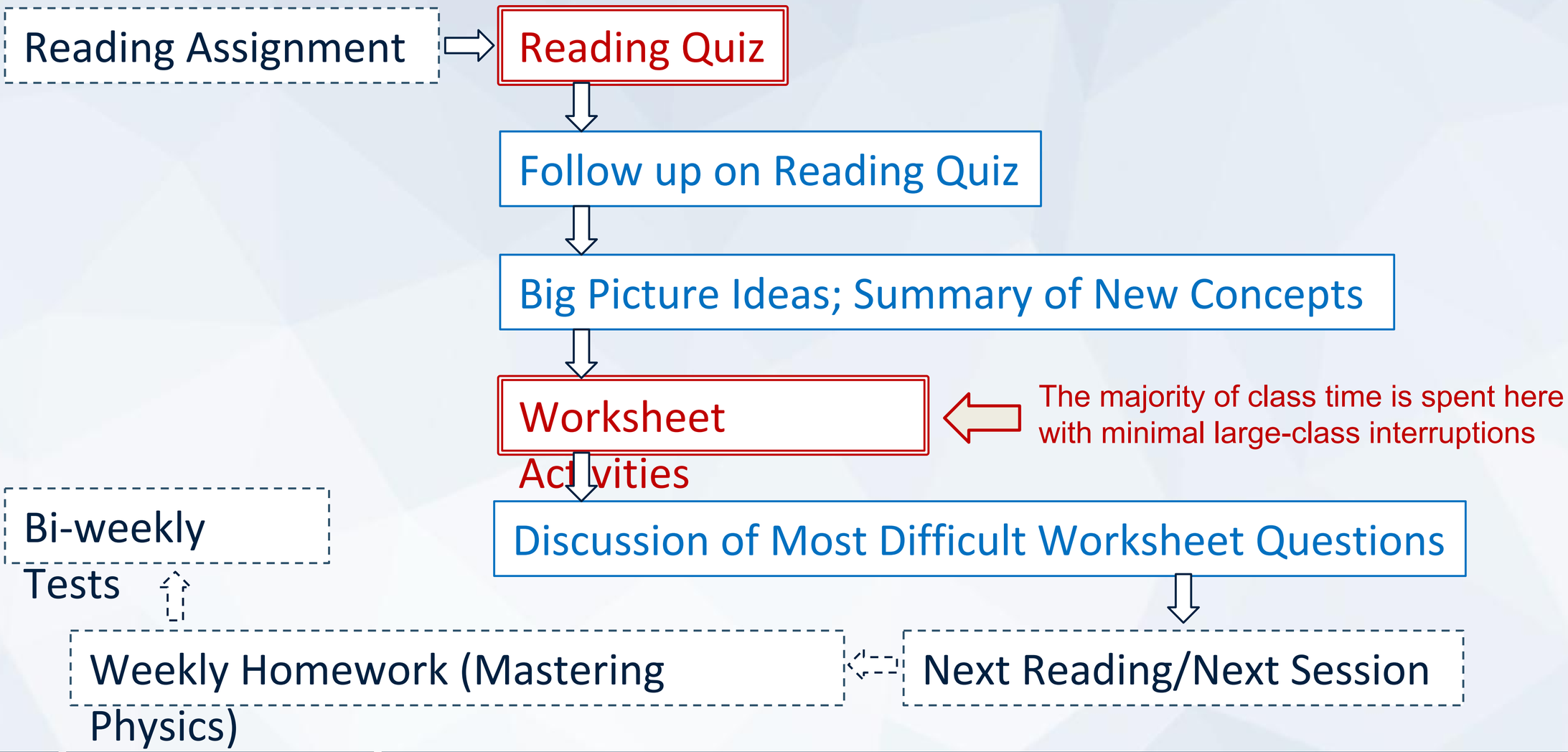
- Looking back at 2014W
  - Transitions between activities were slow
  - The pace was too slow or too fast: it targeted nobody
  - Despite high completion rates for reading assignments, student preparation was unreliable
- Important discovery! The group function in Learning Catalytics improved peer instruction

Case 4: Vantage Physics

- Our solution in 2015W
  - Build a course structure that allows students to work at their own pace
  - Facilitation should look like a lab or tutorial -- checking in on groups without whole-class orchestration
  - Bring in more TAs for support

Case 4: Vantage Physics

- Class time: students ⅔, instructor ⅓



Case 4: Vantage Physics

- Many rounds of deliberate practice
  - Preparation questions communicate specifically what students need to learn before class.
  - Practice with the vocabulary and an initial exploration of the concepts
  - The reading quiz gives students some retrieval practice, followed by expert feedback on the reading quiz questions

Case 4: Vantage Physics

- Many rounds of deliberate practice
  - The worksheets present a concise expert version of the topic and more deliberate practice with lots of timely feedback
  - Online homework with immediate feedback (hint structure)
  - Bi-weekly tests with group component provide more retrieval practice and timely feedback

Case 4: Vantage Physics

- Some large-enrolment courses in Physics have since adopted a similar approach
  - PHYS 117: N=250, Direct Entry, Simon Bates and Carl Michal
  - PHYS 100: N=800, Direct Entry, Stefan Reinsberg, Mayra Tovar and Marcello Pavan

Case 4: Vantage Physics

- Use of TAs
  - Our model in Vantage One has an instructor/TA to student ratio of 1:20
  - TAs are proactively engaging students in discussions
  - In larger classes, TAs can only be reactive in terms of answering questions
  - A ratio of 1:40 or 1:50 is probably sufficient

What resources would you need to make this work in your context?

Summary of strategies

- Note-taking and summaries in active-learning classes
- Resources to support language learners
- Structures to encourage students to describe what they are thinking
- Asynchronous pedagogy and deliberate practice with timely feedback

Further questions?

Thank you.

a place of mind
THE UNIVERSITY OF BRITISH COLUMBIA

UBC 100

Extra slides for various purposes

Test Questions

	2014	2015
Unit conversion question	87% / 88%	86.5%
Magnitude of acceleration from a motion diagram	81% / 77%	48.7%
Using area under the curve to determine a change in a kinematic quantity (2015 had more difficult question)	52%	58.5%
Going from i,j,k notation version of v(t) (2014) or r(t) (2015) to acceleration at a specific time	68%	84.3%
Recognizing that static friction force is less than u_s*N (2014 had the more difficult question)	62%	79.5%
Change in velocity from a force graph	40%	68.6%

2014W Vantage Data (first month of intro Physics)

- Attendance 94% (98% for the same period this past year)
- In-class clicker question response rate 79% for Vantage vs. 93% in P101.
  - Confirmed what we perceived: relatively low engagement with activities and group work.
  - Good homework completion rate, similar to 2015W.