

Replacing a Written Final with a Technical Conversation: Lessons Learned

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PICUP Virtual Conference - Summer 2020

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Outline

- 1 The Technical Conversation
- 2 Initial Reading
- 3 Constrained vs. Open-Ended
- 4 Assessment
- 5 Lessons Learned and Moving Forward

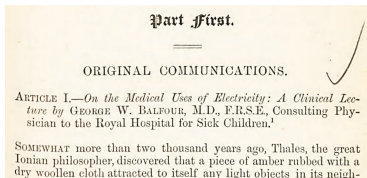
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We replaced the final with a semi-structured, technical chat.

Our class:

- Second-semester, non-calculus-based introductory physics
- 13 students
- Typical majors were biology with some chemistry and exercise science
- Our weekly schedule for virtual classes included an abbreviated version of the technical chat every Wednesday.

- Common preparatory reading

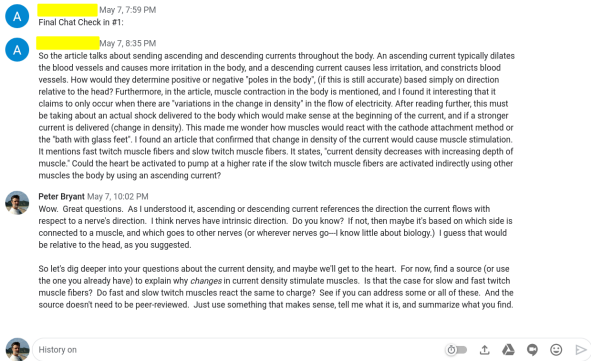


- 1 Student's first post
- 2 I comment and ask question
- 3 Student's response and question
- 4 I comment and ask question
- 5 Student's final response

SUN 26	MON 27	TUE 28	WED 29	THU 30	FRI May 1	SAT 2
3	4	5 Preparation	6	7 Asynchronous Chat First Post	8	9
10 Asynchronous Chat	11 Final Post	12	13	14	15	16
17	18	19	20	21	22	23

- **Students' initial posts**
 - Give reading context
 - Most interesting part?
 - Ask a technical question
- **Plans for my responses**
 - 1 Address question and charge student with finding modern source and asking more questions
 - 2 Ask student to design an experiment to answer their question

● Google Chat



A screenshot of a Google Chat conversation. The chat window shows a header with a profile picture of a person with a blue checkmark, the name "A", and the text "History on". The chat history contains three messages:

- Message 1:** A yellow bubble with a blue circle containing the letter 'A'. The text reads: "Final Chat Check in #1:". The timestamp is "May 7, 7:59 PM".
- Message 2:** A yellow bubble with a blue circle containing the letter 'A'. The text reads: "So the article talks about sending ascending and descending currents throughout the body. An ascending current typically dilates the blood vessels and causes more irritation in the body, and a descending current causes less irritation, and constricts blood vessels. How would they determine positive or negative 'poles in the body', (if this is still accurate) based simply on direction relative to the head? Furthermore, in the article, muscle contraction in the body is mentioned, and I found it interesting that it claims to only occur when there are 'variations in the change in density' in the flow of electricity. After reading further, this must be taking about an actual shock delivered to the body which would make sense at the beginning of the current, and if a stronger current is delivered (change in density). This made me wonder how muscles would react with the cathode attachment method or the 'bath with glass feet'. I found an article that confirmed that change in density of the current would cause muscle stimulation. It mentions fast twitch muscle fibers and slow twitch muscle fibers. It states, 'current density decreases with increasing depth of muscle.' Could the heart be activated to pump at a higher rate if the slow twitch muscle fibers are activated indirectly using other muscles the body by using an ascending current?". The timestamp is "May 7, 8:35 PM".
- Message 3:** A white bubble with a profile picture of Peter Bryant. The text reads: "Wow. Great questions. As I understood it, ascending or descending current references the direction the current flows with respect to a nerve's direction. I think nerves have intrinsic direction. Do you know? If not, then maybe it's based on which side is connected to a muscle, and which goes to other nerves (or wherever nerves go—I know little about biology.) I guess that would be relative to the head, as you suggested." The timestamp is "May 7, 10:02 PM".

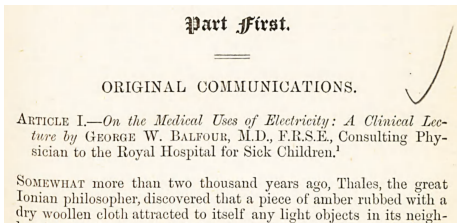
Below the messages, there is a text input field with the text "History on" and a row of icons: a power button, an upload icon, a share icon, a speech bubble icon, a smiley face icon, and a play button icon.

● Chat with me; not role-playing

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Balfour, G. W. (1879).
On the Medical Uses of Electricity: A Clinical Lecture.
Edinburgh medical journal.



- Phenomenological discussion of effects of electricity in body
- Diction: *Galvanic, Faradic, Franklinic*
- Purpose was to focus the responses

Initial Reading: Lessons Learned

This reading worked well because:

- Historical, anecdotal, and easy to read
- No math
- Very few theoretical explanations of phenomena
 - On their own students had to connect to class material

Students enjoyed it!

... perhaps the biggest key to success

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Constrained	Open-ended
Professor steers	Students steer
Worse engagement (?)	Better engagement (?)
Cheating more likely	Cheating less likely
Less difficult to grade	More difficult to grade

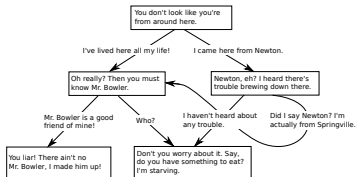
Example destinations from student navigation:

- canine psychology
- human pain threshold

Constrained vs. Open-ended: Lessons Learned

- Share a rubric
 - “Physics experiment proposal, X pts”
- Anticipate when asking questions
 - “How would you measure the effects of current on human tissue without relying on human reaction?”
- Tree structure to steer conversation

Tree



Linear

Final Chat Check in #1:

May 7, 8:25 PM

So the article talks about sending ascending and descending currents throughout the body. An ascending current typically dilates the blood vessels and causes more irritation in the body, and a descending current causes less irritation, and constricts blood vessels. How would they determine positive or negative "jokes in the body"? (If this is still accurate) based simply on direction relative to the head? Furthermore, in the article, muscle contraction in the body is mentioned, and I found it interesting that it claims to only occur when there are "variations in the change in density" in the flow of electricity. After reading further, this must be talking about an actual shock delivered to the body which would make sense at the beginning of the current, and if a stronger current is delivered (change in density). This made me wonder how muscles would react with the cathode attachment method or the "bath with glass feet". I found an article that confirmed that change in density of the current would cause muscle stimulation. It mentions fast twitch muscle fibers and slow twitch muscle fibers. It states, "current density decreases with increasing depth of muscle." Could the heart be activated to pump at a higher rate if the slow twitch muscle fibers are activated indirectly using other muscles the body by using an ascending current?

Peter Bryant May 7, 10:02 PM

How: Great question. As I understood it, ascending or descending current references the direction the current flows with respect to a nerve's direction. I think nerves have intrinsic direction. Do you know? If not, then maybe it's based on which side is connected to a muscle, and which goes to other nerves (or whatever nerves go—know little about biology). I guess that would be relative to the head, as you suggested.

So let's dig deeper into your questions about the current density, and maybe we'll get to the heart. For now, find a source (or use the one you already found) to explain why changes in current density stimulate muscles. Is that the case for slow and fast twitch muscle fibers? Do fast and slow twitch muscles react the same to charge? See if you can address some or all of these. And the source doesn't need to be peer-reviewed... Just use something that makes sense, tell me what it is, and summarize what you find.

History on



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comment 1	comment 2	comment 3	total		points out of 5
5	5	4.5	14.5		
5	5	5	15	comment 1: reall	comment 2: loo
5	4	4	13		comment 2: did
5	4	5	14		comment 2: not
4	5	4	13	comment 1: more about training c	
5	5	4.5	14.5		
4	5	4.5	13.5	comment 1: ques	comment 2: ans
-	-	-	--		

- Assessment was **difficult**
 - I didn't know what to expect and didn't provide a rubric
 - Conversations varied significantly
 - I was a part of the conversation. **How to normalize for me?**
- When a student did well, it was clear. When a student did poorly, it was difficult to separate my own contributions.

- To normalize for my presence, script a few responses ahead of time:
 - *<subject> is indeed interesting. I wonder how <phenomena> can be modeled by a circuit. How would you model it with a cap in your circuit? How would you model it without?*
 - Maintains open-endedness?
- In a regular semester, the chat is better suited for a lab midterm.
 - I plan to use it in lab to gain experience.

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Conclusions

What worked:

- The reading was a good choice (and was important!)
- Students did in fact work on their own

To change:

- Provide a rubric and specify **physics experiment**
- Find platform that allows tree-like conversation structure
- Use the technical chat for a laboratory midterm
- Script some response templates

To consider:

- Open responses so entire class can see

Final note:

- I spent 10-15 minutes on each post. Small classes only.

Thank you!

And thanks to my students!