

Finding the *write* level of engagement: Getting students to present at the board



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Curriculum Fellows Program Education Workshop Series

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Workshop Objectives

- Discuss the rationale for incorporating board-based student presentations (i.e. chalk talks) as a component of coursework and give examples of learning objectives that can be achieved through board-based presentations.
- Compare and contrast chalk talks to PowerPoint presentations and assess when and where implementation of a chalk talk activity into their own courses might be appropriate
- Describe examples of student chalk talks implemented in both undergraduate and graduate biology courses and relate those examples to their own course objectives and student populations



Workshop Objectives (contd.)

- Expand upon the workshop activity to further develop a chalk talk-based activity aligned with learning outcomes for their own course(s)
- Discuss practical strategies of implementing chalk talk-based activities in class and assess the strengths of weaknesses of different implementation decisions such as instruction scaffolding, grading rubrics, and peer vs. instructor feedback



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Student Presentations & Peer Teaching as a Way to Increase Engagement & Improve Outcomes

When and how have you seen student presentations used in classes? Take 2 minutes to discuss with your neighbor. We'll then ask for volunteers to share with the group.

Take-home messages from literature:

- Peer teaching is a student-centered approach that promotes learning
- Helps students develop in-depth understanding of the material that they present
- Enhances professional development by teaching presentation skills

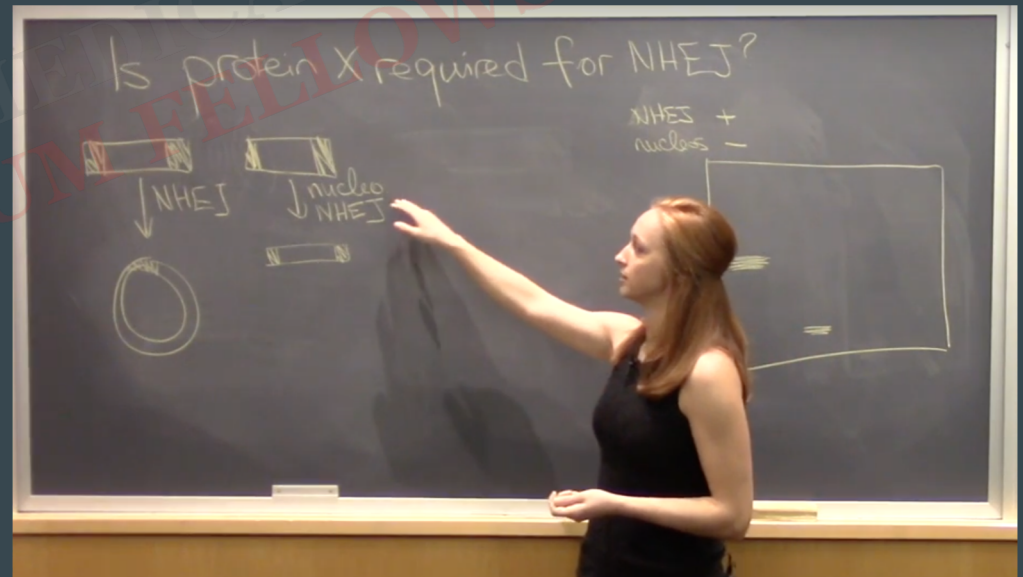
Eberlein et al., 2008; Laird et al., 2005; Ramaswamy et al., 2001

Student Presentations are Often Delivered via PowerPoint...

...As an Alternative, Students can Write at the Board

“Chalk Talks”:

- Presentations given at the board with no other visual aids
- Presenters need to draw and write out all content
- Used in various academic and professional settings



Small Group Discussion: Strengths and Limitations of Chalk Talks

On a sheet of paper, take 3-4 minutes with your group to brainstorm a few strengths and limitations of chalk talks compared to traditional PowerPoint presentations. We will then ask for volunteers to share their ideas.



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Rationale for Having Students Give Chalk Talks

- Improves science communication skills
- Increases student confidence in science communication and presentation
- Prepares students for future academic milestones (e.g. pre-qualifying exam, postdoc and faculty interviews)
- Very versatile - can be used to meet many learning objectives
- Presenters select most critical information since they have to take the time to write/draw them
- Presenters can more readily respond to audience questions and comments in real time throughout the presentation

We're going to give examples of chalk talks from our own courses and lead you through activities so you can design chalks talk activities for your own classes.

Activity: List Learning Objectives for one of your Classes

Take ~3 minutes to write down key learning objectives for one of your current classes or a hypothetical course that you would teach.

- These should complete the statement “at the end of the course, students will be able to...”
- Can include both content and skill-based objectives



Chalk Talk Implementation Example: “Sex and the Brain”

- Undergraduate course at Harvard College
- A “neurotutorial course”
 - Small format (5-15 students)
 - Primarily juniors
 - In-depth study of a particular topic in neurobiology using primary literature
 - Meets once a week (~80 minutes) for the entire academic year
- Topic of the course: sex differences in the nervous system and sexually dimorphic behaviors



Chalk Talk Implementation Example: “Sex and the Brain”

- Learning objectives for my course:

I. **Scientific Content:** Students will be able to **extract and summarize basic content (e.g. facts or methods) from scientific sources** such as primary research articles and review articles.

II. **Scientific Literacy:** Students will be able to **find pertinent information from primary and secondary scientific sources**, evaluate the validity of scientific claims by assessing the merits and caveats of specific experimental approaches, and **describe how specific research findings fit into a broader conceptual context**.

III. **Communicating Science:** Students will be able to effectively write about science for scientific and general audiences, and effectively **convey scientific information to peers and to a general audience through oral presentations**.

Chalk Talk Implementation Example: “Sex and the Brain”

- Implemented in spring semester of the class
- Final class symposium
 - 5-10 minute chalk talk on topic of student’s choosing, must describe at least one experimental result from a primary scientific article



Sex and the Brain Class Symposium

Thursday, April 19
6:30 - 8:30 pm
Robinson 107



Open to the public!

Join us for an evening of short “chalk talks” delivered by the students of NEURO101G. Light refreshments will be served.

Dylan Parker

Seq-ing Answers: RNA-Seq for Exploring the Brain

Ellie Underwood

What Makes us Tick? Differences in the Regulation of Circadian Rhythms in Men and Women

Gabrielle Thomas

Use It and Lose It: Short-Term Plasticity in the Olfactory System

Heather Forbes

Why White Matter Differences in the Brain Really Matter in Autism

Kristen Fang

Fear Extinction: Estrogen and Stress Susceptibility

Melonie Vaughn

Extreme Maleness: Autism and Androgens

Orgilmaa Munkhbaatar

Brain Protection and Recovery: Microglia Activation

Rajdeep Trilokekar

ABC: Alcohol, β -endorphins, and Corticosterone

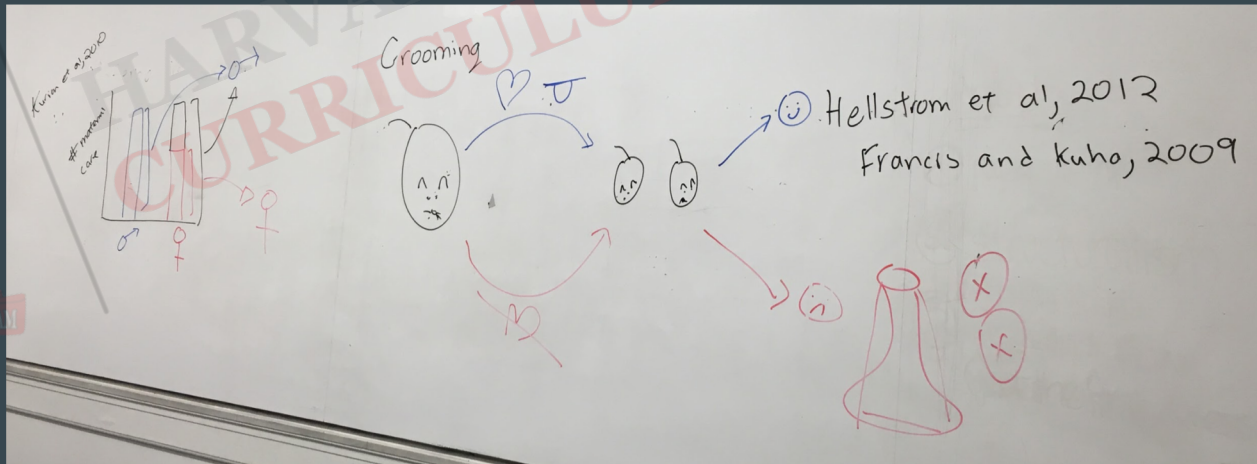
Richard Wang

Defining Sex through Dimorphic Alternative Splicing



Chalk Talk Implementation Example: “Sex and the Brain”

- In preparation of final assignment: chalk talks incorporated into weekly paper discussions
 - Topics are pre-assigned, correspond to background concept or method from paper
 - 5-10 minute chalk talk, still must include at least one experimental result from a primary research article other than the discussion paper
 - Each student did this 2x during semester



Chalk Talk Implementation Example: “Sex and the Brain”

Alignment to Course Learning Objectives

Extract and summarize basic content (e.g. facts or methods) from scientific sources

Find pertinent information from primary and secondary scientific sources

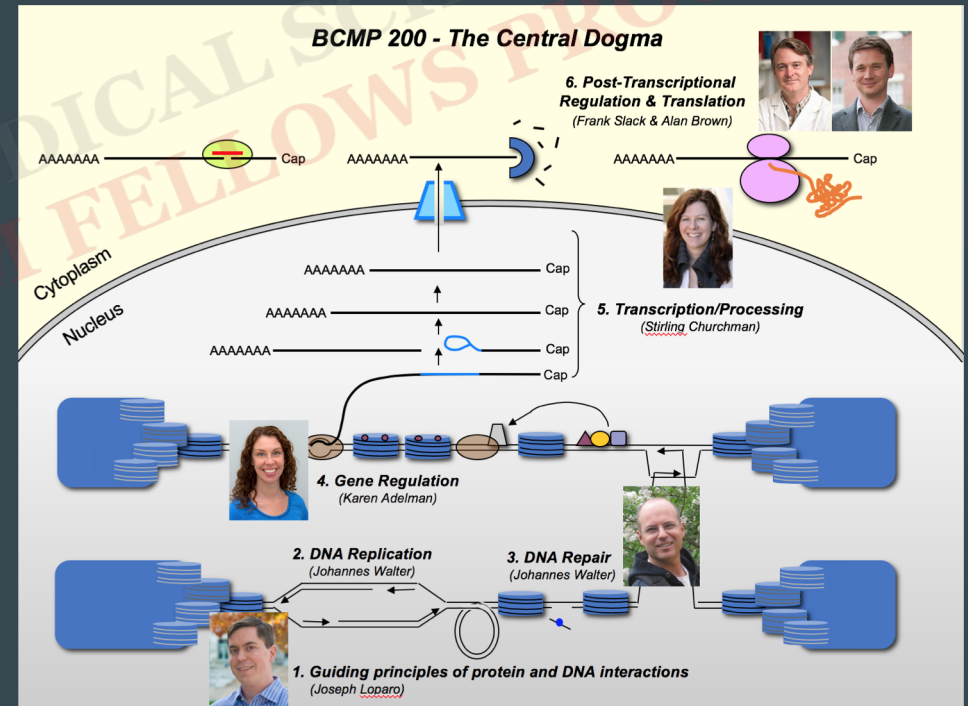
Describe how specific research findings fit into a broader conceptual context

Convey scientific information to peers and to a general audience through oral presentations



Chalk Talk Implementation Example: “Principles of Molecular Biology”

- Graduate course at Harvard Medical School
 - 50-85 students
 - Primarily 1st year bioscience PhD students
- Course is split into 6 modules about the Central Dogma
- Each module includes lectures and a small group discussion section (maximum of 6 students per section)



Chalk Talk Implementation Example: “Principles of Molecular Biology”

- Learning objectives for the course:

I. Scientific Content: Students will be able to describe the cellular processes of DNA replication, DNA repair, gene regulation, transcription and translation and address open-ended experimental research questions based on the Central Dogma.

II. Experimental Methods and Design: Students will be able to select and justify choices of experimental techniques for testing given hypotheses, identify required experimental controls, and illustrate expected results for various molecular biology and biochemistry techniques discussed in the course.

III. Professional Skills: Students will be able to visualize protein structures and clearly communicate experimental proposals through oral presentations.

Chalk Talk Implementation Example: “Principles of Molecular Biology”

- Implemented in small group discussion sections
- Student chalk talks are responses to open-ended experimental design questions which specify hypotheses to be tested

Sample Experimental Design Question

Your laboratory has recently identified a novel protein X, which you believe may be involved in non-homologous end joining (NHEJ). Given its sequence conservation to a known chromatin remodeler in yeast and its weak ATPase activity in vitro, you hypothesize that X is involved in removing nucleosomes near the DNA double strand break and thus enabling repair by the NHEJ machinery. Using *in vitro* biochemical assays describe how you would test the hypothesis that:

- X is required for NHEJ in the context of chromatin
- X is a chromatin remodeler

Assume you are able to assemble a nucleosome onto the end of a DNA substrate and that you have purified X and the necessary NHEJ factors.

Experimental Context/
Background

Testable Hypotheses

Assumptions/ Reagents
Available

Chalk Talk Implementation Example: “Principles of Molecular Biology”

- Students are expected to
 - contextualize the experimental question
 - explain their experimental strategy including relevant controls
 - justify their choice of methodology
 - illustrate expected results and explain how they address the hypothesis
- Chalk talks are ~25 min inclusive of questions and discussion
- Students present 2 chalk talks during the semester
 - First talk is uninterrupted with questions and discussion following the presentation
 - Section leaders and peers can challenge the presenter with questions and alternative approaches throughout the presentation



Chalk Talk Implementation Example: “Principles of Molecular Biology”

Alignment to Course Learning Objectives

Address open-ended experimental research questions based on the Central Dogma

Select and justify choices of experimental techniques for testing given hypotheses

Identify required experimental controls

Illustrate expected results from molecular biology and biochemistry techniques

Clearly communicate experimental proposals through oral presentations



Activity: Revisit Lists of Learning Objectives

Pull out the list of learning objectives you generated earlier in the workshop. We will ask for volunteers to share some of their learning objectives.

Take ~1 minute to get together with your neighbors and select one learning objective from your lists as the focus for the chalk talk design activity.



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Group Activity: Design your own Chalk Talk Assignment

In your small groups, take ~ 5 minutes to outline a chalk talk assignment that is aligned with your given learning objective. Each small group will then share.

- Decide which student demographic you will be your target audience for your chalk talk activity
- Describe the overall organization of your chalk talk activity
 - What content will students be expected to cover?
 - What is the source of the material to be presented?
 - What is the expected length of the talk?
 - How do the expectations map onto your learning objective?

Implementation Considerations

Instructional Resources

Student Assessment

Performance

Affect



Summary of Implementation Considerations

Instructional Resources:

How will you scaffold the required skills? (e.g. with other assignments or within the chalk talk assignment).

What other skills would students need to practice for this assignment?

What instructions/resources will be provided to students? What information will they need to seek out on their own?

How will you convey the standards for a “good” vs. “bad” chalk talk?

Performance-Based Assessment:

Will you use a rubric? If so, what are the essential components of your rubric?

Who will provide feedback? (e.g. peers, instructors, self evaluation) and what is the timing of feedback? (e.g. during/after the talk)

Will you use other assessments to measure student learning gains?

Formative and/or summative assessment?

How are grades calculated?

Assessment of Affect:

Which aspects of affect do you wish to assess?

What types of questions will you ask?

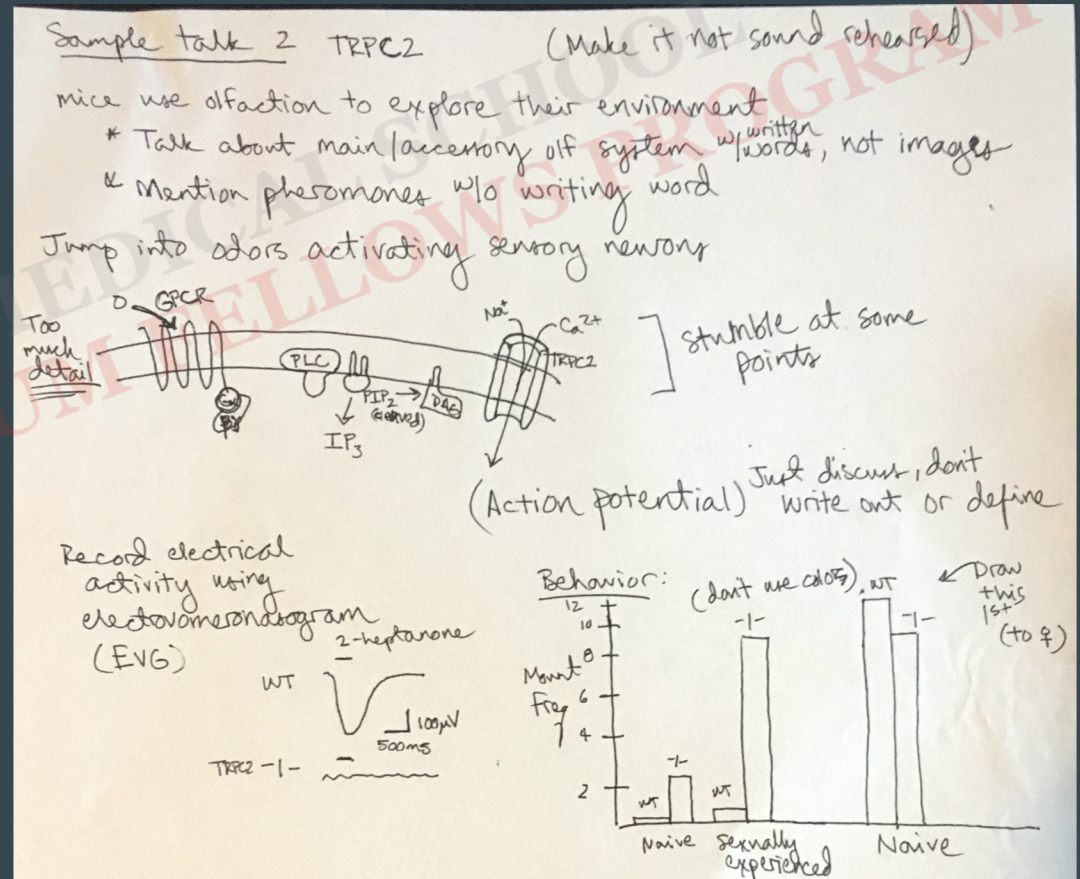
When will these be administered in relation to the activity? (e.g. pre-course, post-course, at intervals throughout the course)

Implementation Considerations: “Sex and the Brain”

Instructional Resources

- Scaffolded final presentations with in-class chalk talks
- Skills that had been previously introduced in other assignments:
 - Finding scientific articles
 - Conveying scientific information graphically
 - Extracting meaningful information from scientific articles
- I modeled a “good” and a “bad” chalk talk on the same topic back-to-back when I introduced assignment; also provided assignment guidelines.

Notes for a “bad” chalk talk:



Implementation Considerations: “Sex and the Brain”

Performance-Based Assessment

- Grading rubric (same for final presentations and in-class presentations)
- In-class presentations: students and I completed rubric (though I didn’t look at students’ feedback to each other); only I graded final presentations
- Used in-class chalk talks as *formative* assessment; final chalk talks as *summative* assessment
- Final talk grade counted “for real”; in-class presentation grades were just for feedback

Weimer, 2012

Scoring: 3 = excellent; 2 = good; 1 = needs improvement

Scientific Content			
Is the information clear and accurate?	1	2	3
Is at least 1 experimental result from a different paper described?	1	2	3
Are (brief) citations given when specific experiments are described?	1	2	3
Is there a lack of jargon (or are technical terms defined)?	1	2	3
Comments:			
Chalk Talk Presentation			
Is the talk organized, with a logical flow?	1	2	3
Is text used appropriately (e.g. not too much or too little)?	1	2	3
Are graphics informative and easy to understand?	1	2	3
If multiple colors are used, are they used effectively and consistently?	1	2	3
Is the use of the board appropriate (e.g. legible text and graphics, appropriately spaced out, erases when necessary)?	1	2	3
Is the talk within the 5-10 minute time limit?	1	2	3
Comments:			
Delivery			
Is the talk practiced (e.g. doesn’t stumble over text, knows what to write)?	1	2	3
Is the speaker confident?	1	2	3
Does the speaker engage with the audience?	1	2	3
Is the use of notes kept minimal (e.g. notes are referenced, but not just read completely)?	1	2	3
Comments:			

Implementation Considerations: “Sex and the Brain”

Assessment of Affect

- General pre-/post-survey for course focused on self-efficacy
 - Pre-/Post-survey for course focused on general abilities (but not specific to chalk talk) indicated student growth in general scientific communication
- Surveys and written reflections to gain insight into students’ feelings about the assignment
 - Chalk talk-specific survey given at the end of the course and student final reflections indicated that students thought the chalk talk activity was useful and improved their knowledge about and ability to deliver quality chalk talks

Implementation Considerations: “Principles of Molecular Biology”

Instructional Resources

- Explanations of experimental methods during course lectures
- Videos demonstrating “good” and “great” experimental design chalk talks
- A guide on key differences between the two videos
- A summary of assignment expectations (including the grading rubric for presentations) and common mistakes

Chalk talk notes:

Red text included only in “great” talk example

• to detect product formation run the DNA out on agarose gel

• for safety & simplicity detect DNA w/ intercalator Sybr Gold (alternative radiolabeling)

← multimers (a potential complication that could complicate the gel)

← circular product

linear input →

↳ time

+ add a ladder in the “great” → distinguish mono, di, tri etc...

students often lack proper regard to see end joining in the absence of nucleosomes

• Positive control: Demonstrate that you are able to see end joining in the absence of nucleosomes (should look like the gel above)

• Negative control: ~~omit Ku or IIG4~~ → not necessary in this context given its a reconstitution need to show that the presence of

<https://careernavigator.gradeducation.hms.harvard.edu/chalk-talk-training-resources>

Implementation Considerations: “Principles of Molecular Biology”

Performance-Based Assessment

- Section leader completes grading rubric with numerical scores and comments
- Peers are expected to thoughtfully question and comment on proposed experimental designs
- *Formative assessment*: feedback intended to improve future chalk talks and understanding of content for the problem set which follows
- *Summative assessment*: chalk talk grades make up a significant portion of student's grades



Implementation Considerations: “Principles of Molecular Biology”

Assessment of Affect

- Online pre- and post-course surveys on self-efficacy, experience, and comfort
 - Observed increases in self-reported experience and comfort with chalk talks
 - Observed increases in self-efficacy in many research skills
 - Coursework contributes significantly to comfort with experimental design
- Course evaluations
 - Chalk talks frequently cited as a strength of the course and as contributing to professional development
- Online survey with students at multiple levels of graduate standing
 - Chalk talks, experimental design, and experimental techniques were the three factors most frequently cited as most valuable aspects of the course

Kardash, 2000; Anderson et al, 2016

Instructional Resources

- Model chalk talks (good and/or bad; in-person or videotaped)
- Written instructions/resources
 - Description of characteristics of “good” vs. “bad” chalk talks
- Scaffolding

Resources:

- Videotaped examples of “good” and “great” chalk talks accompanied by the experimental design question upon which they were based and an annotation highlighting key differences:

<https://carenavigator.gradeducation.hms.harvard.edu/chalk-talk-training-resources>

Performance-based Assessment

- Have students evaluate each other
- Instructor provides feedback
- Use of grading rubric: considerations/types of rubrics
- In-person oral feedback (or ask the student what worked/didn't)
 - Take photos of whiteboard during/at end of talk and use as basis for discussion

Resources:

- Rubrics: Tools for Making Learning Goals and Evaluation Criteria Explicit for Both Teachers and Learners (Allen and Tanner, 2006)
- Cornell University Center for Teaching Innovation pages on Peer Assessment, Self-Assessment and Using Rubrics: <https://teaching.cornell.edu/teaching-resources/assessment-evaluation>

Assessment of Affect

- Surveys to measure gains in self-efficacy/confidence and level of experience
 - Students retrospectively self-report gains in a post- survey
 - Calculate changes in self-reported data on the same questions in matched data from pre- and post- surveys
- Surveys or course evaluations to gain feedback on activity
 - Perceived value, aspects that they liked/disliked, preparation/resources provided for completing activity

Resources:

- Assessment of Scientific Communication Self-efficacy, Interest, and Outcome Expectations for Career Development in Academic Medicine (Anderson et al, 2016).
- Considering the Role of Affect in Learning: Monitoring Students' Self-Efficacy, Sense of Belonging, and Science Identity (Trujillo and Tanner, 2014).

General Resources on Developing Chalk Talks (primarily for faculty interviews)

- “Demystifying the chalk talk” by Charles Brenner written for ASBMB today:
http://www.asbmb.org/asbmbtoday/asbmbtoday_article.aspx?id=48709
- “PRO TIP: How to give a chalk talk for a tenure-track position in the biomedical sciences” by Leslie B. Vosshall:
<http://vosshall.rockefeller.edu/assets/file/ChalkTalk.pdf>
- “Preparing your academic chalk talk” by Ashley Rowland and Christina Szalinski:
<https://www.ascb.org/compass/compass-points/preparing-academic-chalk-talk/>
- “Demystifying the chalk talk” from the UCSF Office of Career and Professional Development:
<https://static1.squarespace.com/static/542b27b6e4b04193388466d4/t/546240b1e4b08c4a3ae75560/1415725233567/ChalktalkTips.pdf>

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Thank You for Attending!

Please take a minute to complete the evaluation form before you leave. Thanks!



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