Lesson Plan: Teaching Science Through Derek Muller (Veritasium)

Course: Grow Your Own Educator Preparation Program

Grade Level: 9-12 (Future Educators)

Duration: 35-40 minutes

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Date Prepared: December 16, 2025

Learning Objectives

By the end of this lesson, students will be able to:

1. Explain why addressing misconceptions before teaching correct answers improves learning
2. Describe Muller's PhD research findings about "clear" vs. "confusing" educational videos
3. Plan how to surface student misconceptions before introducing new science content

Standards Alignment

Texas TEKS - Instructional Practices (Education and Training Career Cluster):

TEKS	Standard
4	**The student understands the learner and the learning process.** Demonstrate techniques for development of effective relationships with students that foster mutual respect and rapport and result in effective instruction.
5	**The student understands instructional planning and delivery.** Present subject matter effectively, including selecting and using a variety of instructional strategies to promote student success.
7	**The student creates an effective learning environment.** Describe and implement a safe and effective learning environment; demonstrate teacher characteristics that promote effective learning.

Connection to Educator Preparation:

- Develops understanding that students arrive with pre-existing ideas (not blank slates)
- Models research-based instructional design (addressing misconceptions first)

- Demonstrates how to create productive confusion that drives learning
- Shows the difference between feeling confident and actually understanding

Source: TEKS from `teks/practices/generated/` (Instructional Practices course materials)

Materials Needed

- ■ Presentation slides (slides.yaml) - displayed via projector/screen
- ■ Reading passage (reading.md) - displayed for students to follow along
- ■ Group discussion worksheet (worksheet.md) - students access on their devices
- ■ Paper and pencils for group note-taking
- ■ Google Classroom quiz (created from quiz.md via Automagical Forms)

Lesson Sequence

Opening (5 minutes)

0:00 - 0:05

- Begin with the surprising claim: "Students who watch clear videos often learn less than students who watch confusing ones."
- Let that sit. Ask: "Does that surprise you? Why might that be true?"
- Present learning objectives
- Frame the lesson: "Today we'll learn from Derek Muller, whose PhD research changed how we think about teaching science."

Direct Instruction (10 minutes)

0:05 - 0:15

- Present slides covering:
  - ■ Who Derek Muller is and his PhD research
  - ■ The experiment: clear videos vs. confusing videos
  - ■ Why misconceptions must be addressed first
  - ■ The "collision" where learning happens
- Read aloud the reading passage while students follow along on screen
- Key check: "Why did students who felt confident actually perform worse?"

Guided Practice - Group Discussion (15 minutes)

0:15 - 0:30

- Organize students into groups of 3-4
- Direct students to access the worksheet on their devices
- Explain instructions: discuss prompts verbally, summarize key points on paper
- Circulate among groups to:

    - Ask: "What misconception would you surface? How?"
    - Push for specifics: "What exact question would you ask?"
    - Connect to their future students: "How would this work with 2nd graders? 8th graders?"
- At 0:28, give a 2-minute warning to wrap up discussions

Closure (5 minutes)

0:30 - 0:35

- Bring class back together
- Invite 2-3 groups to share a specific misconception they'd surface and how
- Summarize main takeaways:
    - Students don't arrive empty-headed—they have ideas already
    - Clear explanations can slide past wrong ideas without fixing them
    - Surface misconceptions FIRST, then teach
    - Learning happens at the collision between belief and reality
- Transition to assessment

Assessment (5-8 minutes)

0:35 - 0:40

- Direct students to Google Classroom to complete the quiz individually
- Remind students: questions are randomized, no retakes, answers not shown at end
- Remain available for technical questions

Differentiation Strategies

For students needing additional support:

- Pair with supportive peer during group discussion
- Provide sentence starters: "A misconception about [topic] is..." or "I would ask students..."
- During circulation, spend extra time with these groups to model the process
- Focus discussion on Prompts 1 and 3 (most concrete)

For advanced students:

- Assign discussion facilitator role within their group
- Pose extension: "How would you know if a misconception was truly addressed?"
- Challenge them to design a pre-test that would reveal misconceptions
- Explore Prompt 6 (teacher's own misconceptions)

Assessment

Formative Assessment:

- Observation during group discussions (specificity of misconceptions identified)

- Quality of strategies proposed for surfacing wrong ideas
- Connections to age-appropriate implementation

Summative Assessment:

- Google Classroom quiz: 8 multiple choice and true/false questions
- Automatically graded; results available for instructor review
- Quiz data informs whether concepts need reinforcement in future lessons

Reflection (Post-Lesson)

To be completed after teaching:

What worked well:

What needs adjustment:

Student engagement observations:

Notes for next time:

Appendix

Key Vocabulary:

- **Misconception**: A wrong idea or belief that a student holds before instruction
- **Collision**: The moment when a student notices that their belief contradicts reality
- **Surfacing**: The act of making hidden beliefs visible so they can be addressed

About Derek Muller:

Derek Muller (born 1982) is an Australian-Canadian science communicator and the creator of the YouTube channel Veritasium. He earned his PhD in physics education from the University of Sydney in 2008. His thesis research demonstrated that educational videos addressing common misconceptions were more effective than traditional clear explanations. Veritasium has over 15 million subscribers.

Additional Resources:

- Veritasium YouTube channel
- Muller's thesis: "Designing Effective Multimedia for Physics Education"
- "Why videos go viral" TED talk by Derek Muller