

Navigating Climate Change in the Classroom: Teacher preparation, practices and perceptions

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Introduction



Teacher Preparation

- Knowledge
- Strategies
- Practices

Influences

- Controversy
- Standards
- Resources

Professional development

- In Community
- Sustained
- Relevant

Context of this work

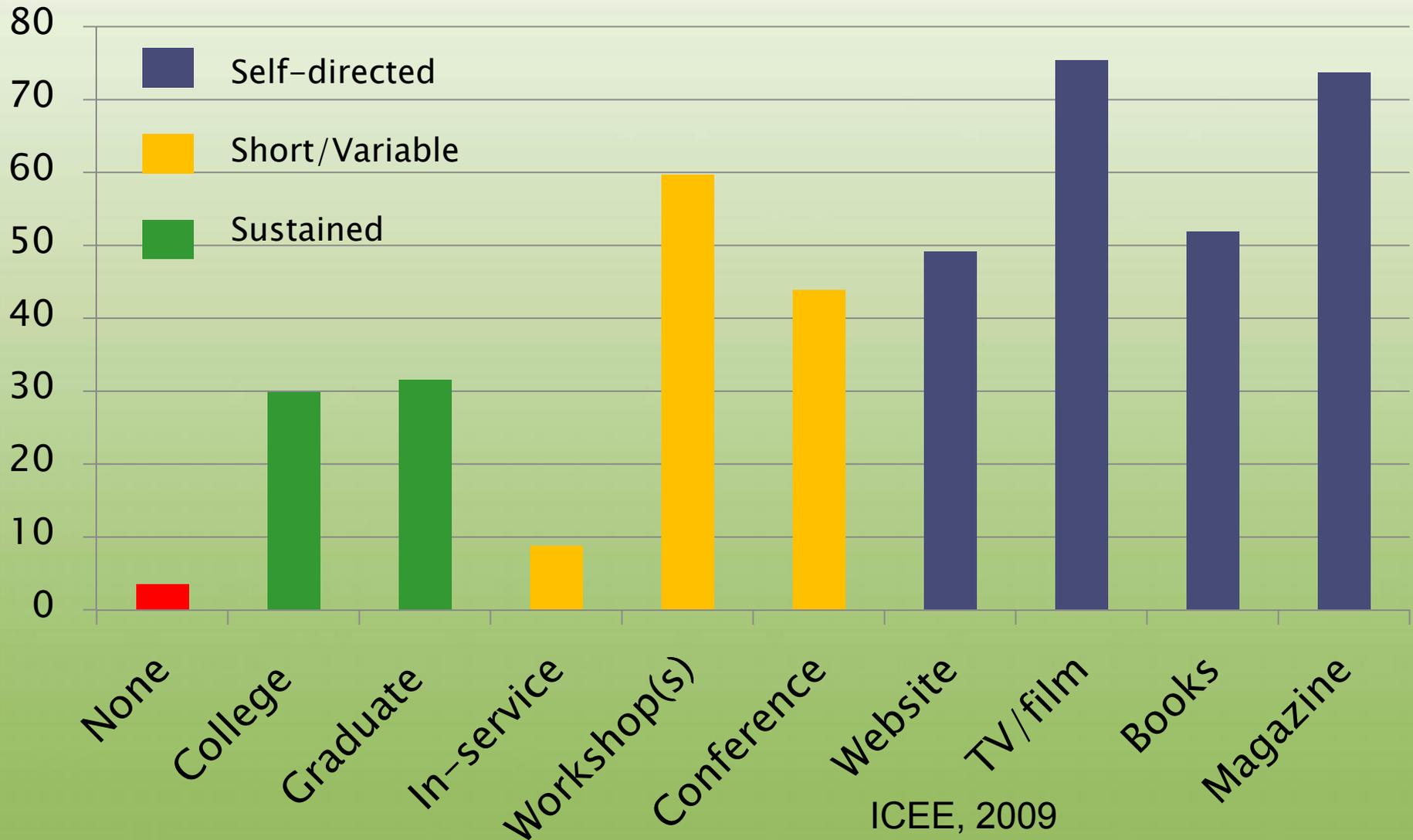
Year	Project	Secondary respondents (N)	Degree of engagement
2009	ICEE Needs Assessment	284	61%
2010	CLEAN Invitational Survey	300	56-93%
2011	CLEAN Informant Network	145 (97% response rate)	80% middle school 88% high school



What do you hear from
teachers about their
preparation?
Their perceptions about
climate science?

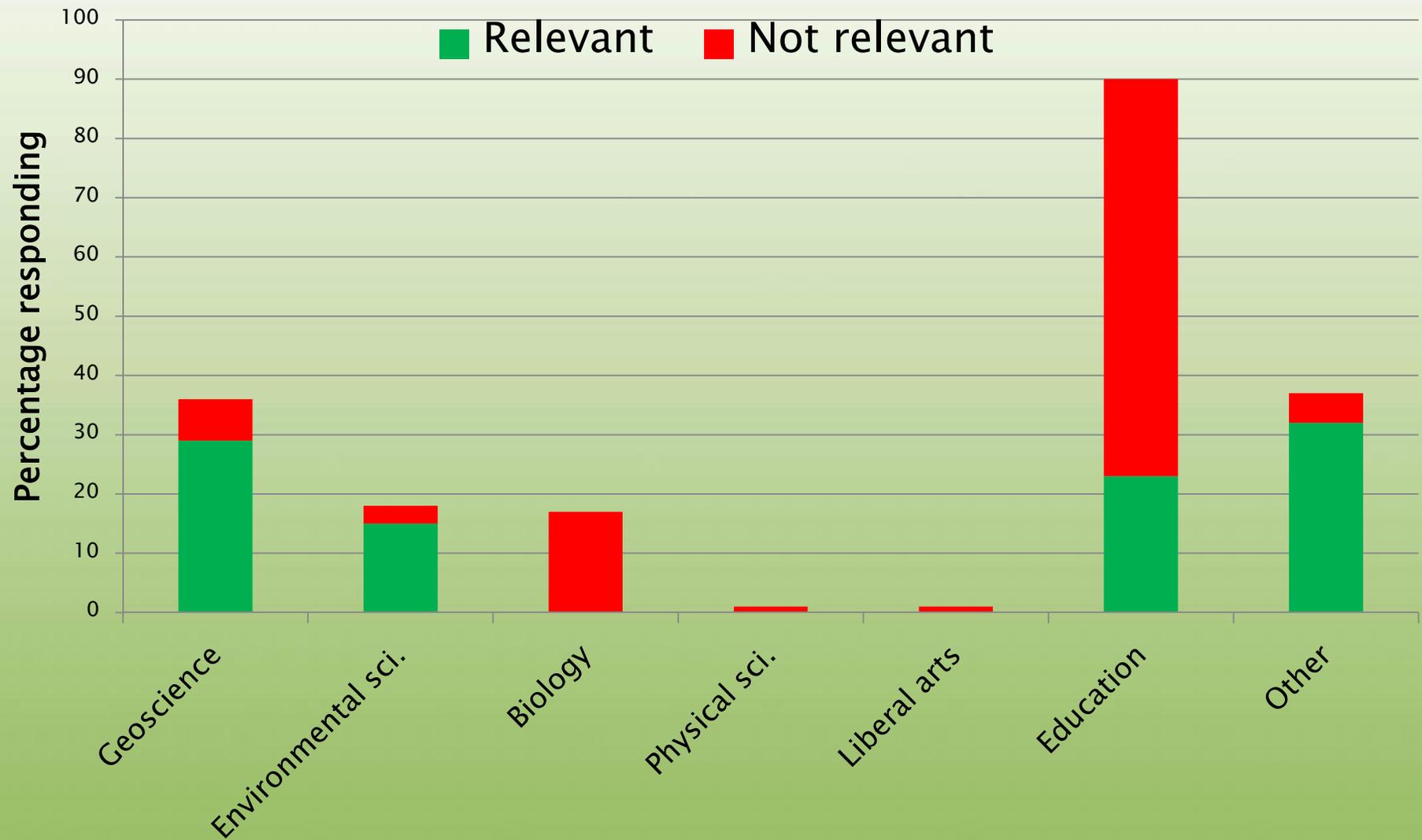
Preparation: learning experiences

(%)



ICEE, 2009

Perceived relevance of degree

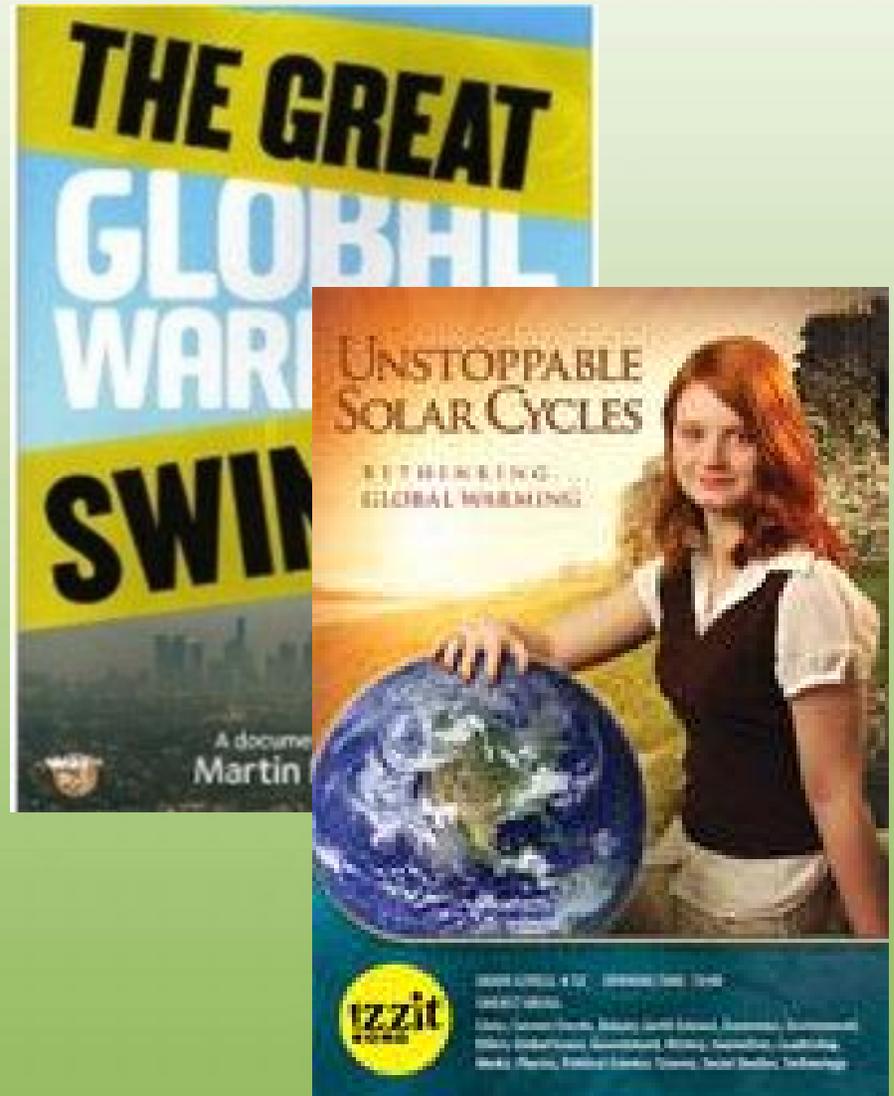


Field of highest degree and perceived relevance

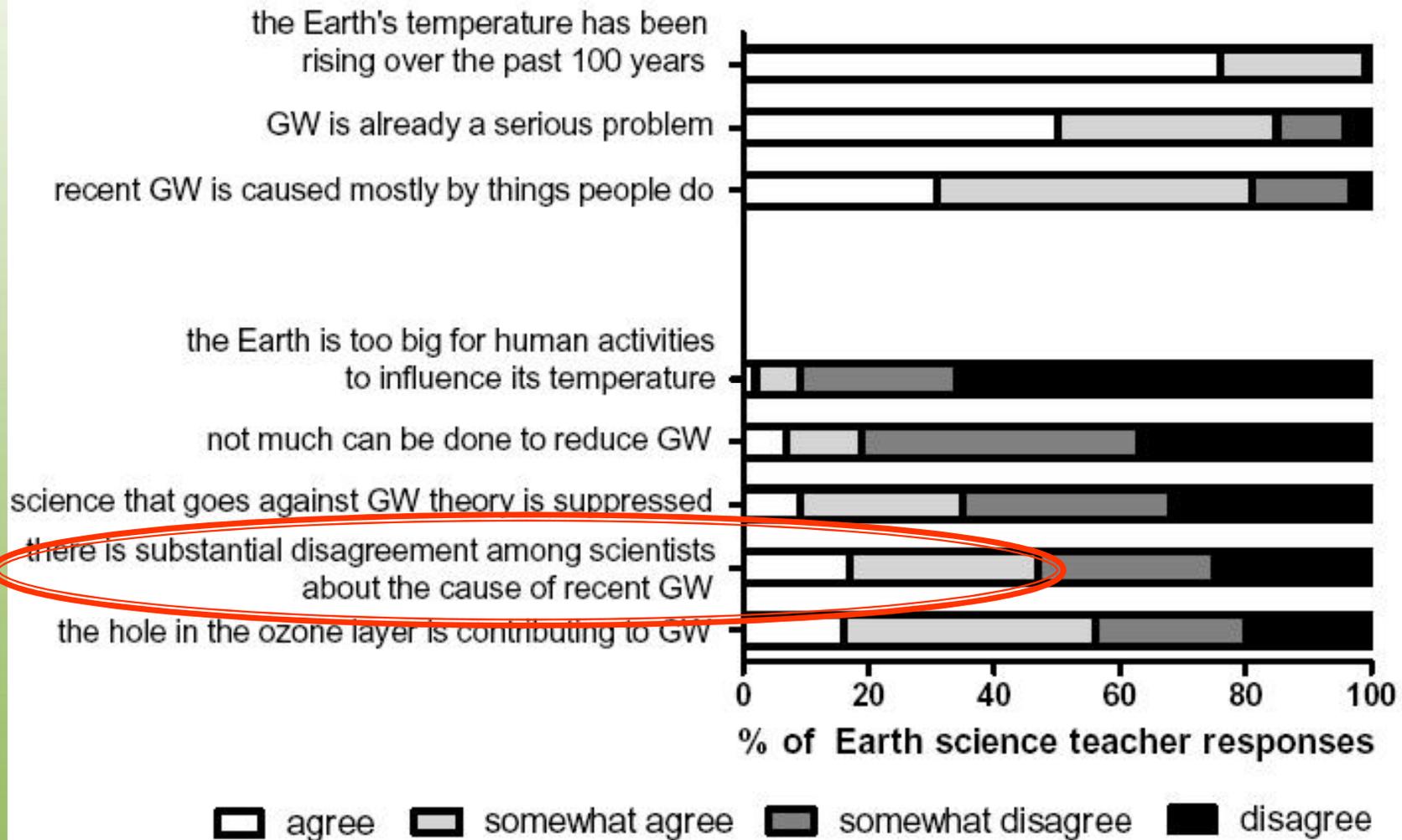
Preparation: Coherent knowledge

- More comfort with Earth Systems
- Less comfort
 - Climate concepts (greenhouse effect)
 - Emerging topics (what will happen here?)
 - Evidence—how scientists know

“I was confused by the Izzit ‘*Unstoppable Solar Cycles*’” ICEE 2010, CLEAN 2011

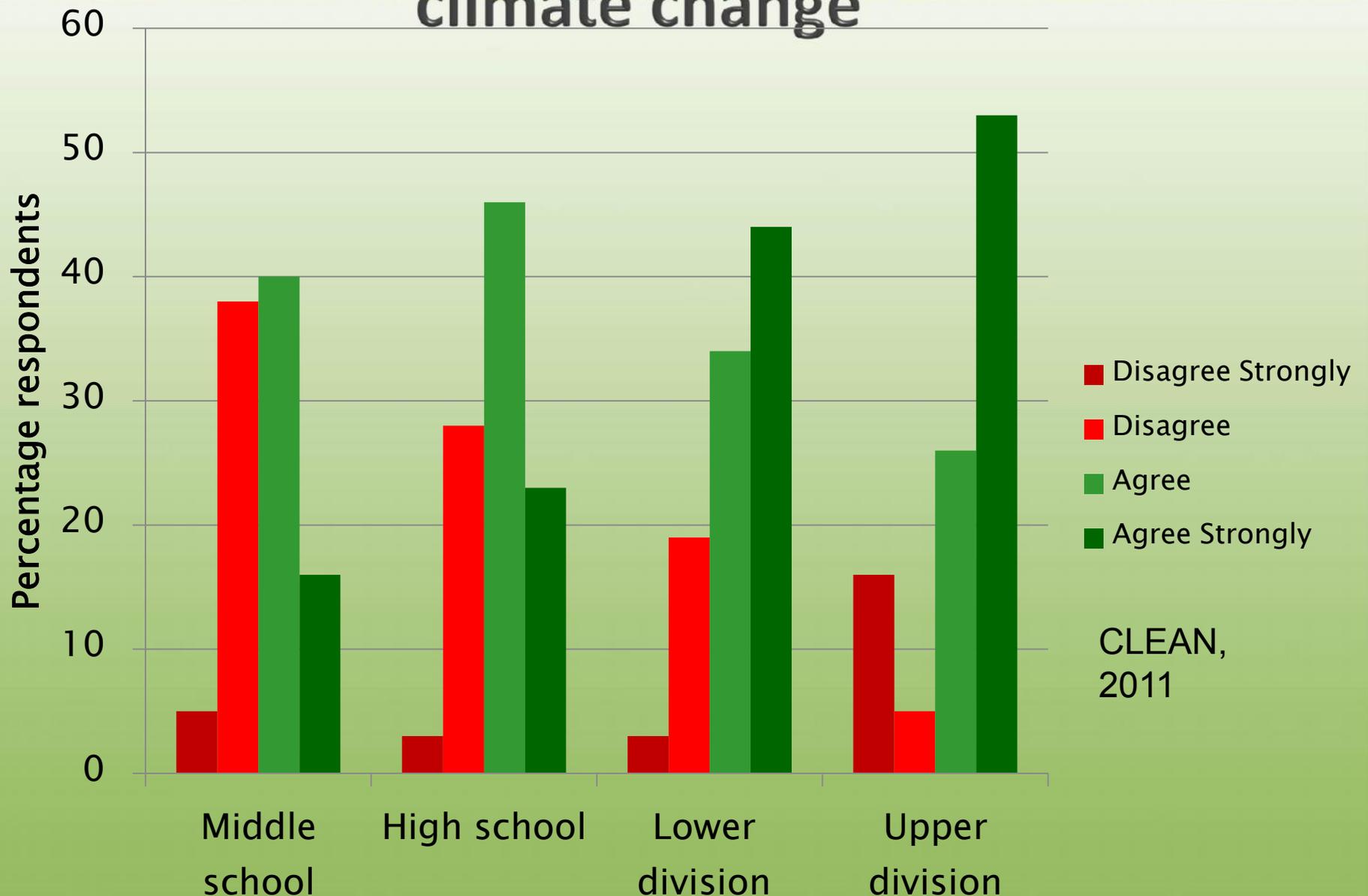


Preparation: Alignment with science

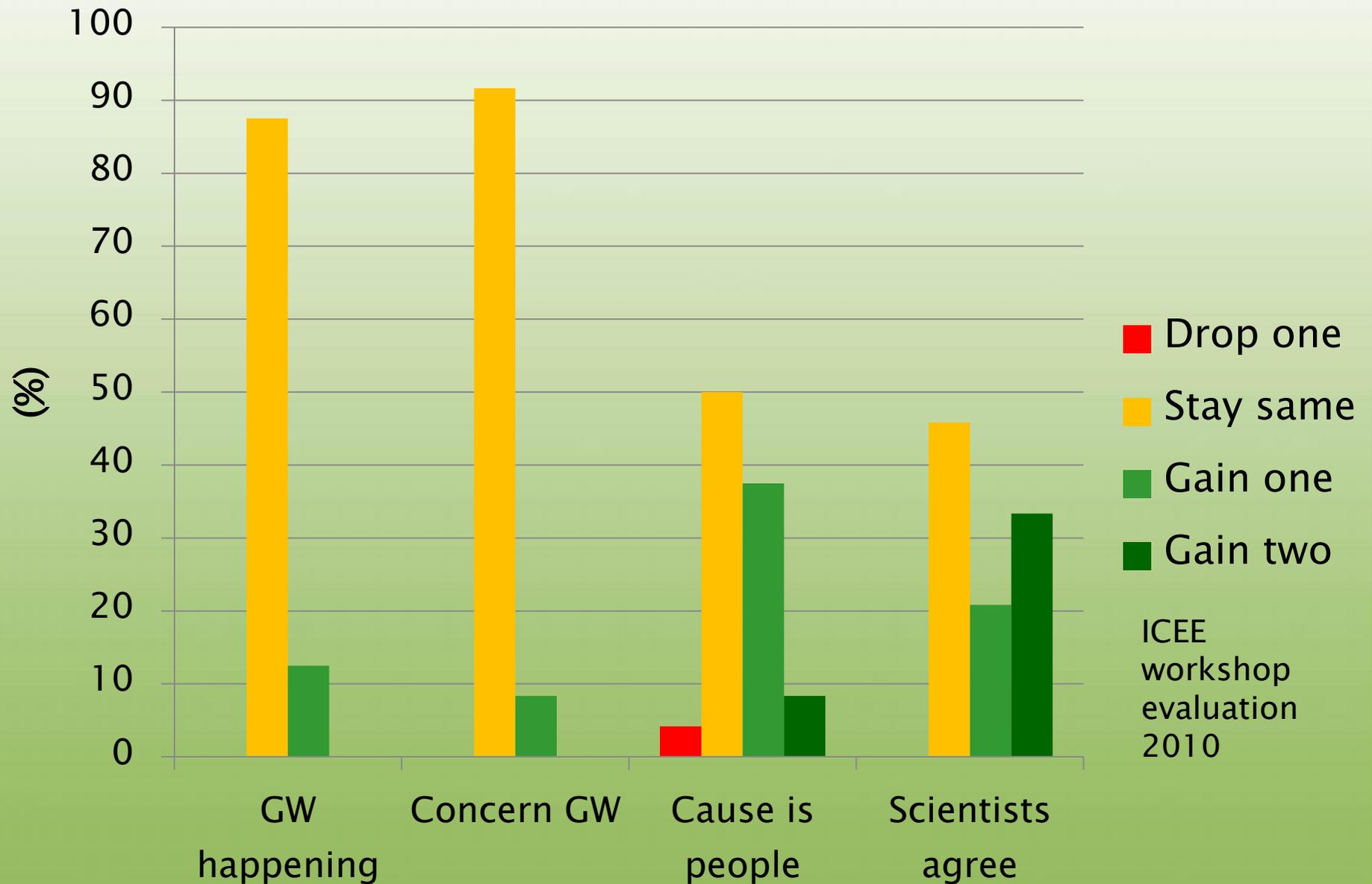


Wise, 2010

“Scientists agree about the causes of recent climate change”

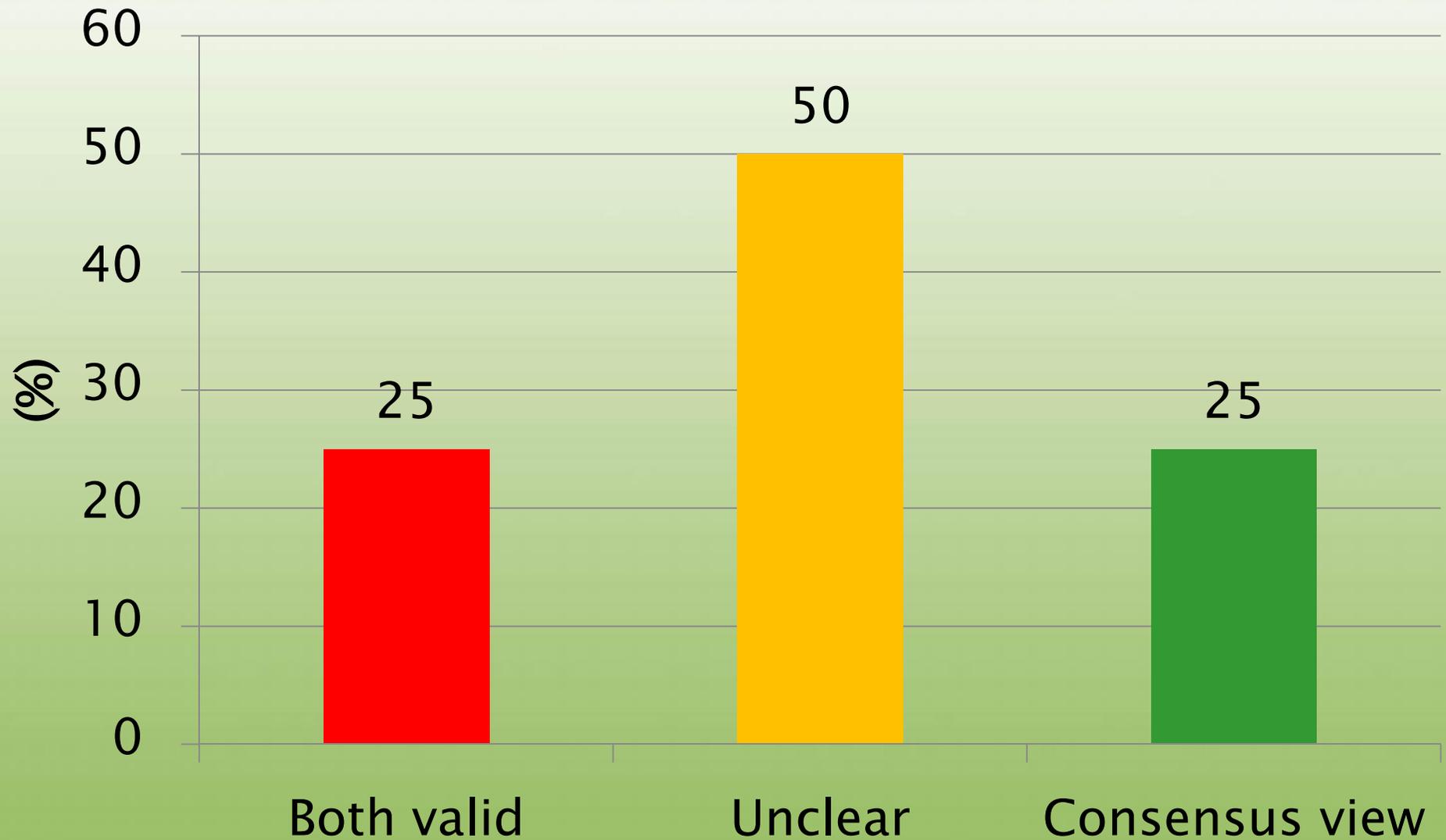


PD shifts knowledge



ICEE
workshop
evaluation
2010

“Both sides” Reasoning 2007



Wise, 2010

Climate science not accepted

2009–2011

- “...global climate change is both premature and over-hyped, too much media, too little long term science investigation other than recent trends...”
- “I was taught...in late 1960 that we were in fact entering into another “ice age” and today... I am to teach the other end of that continuum?”
- “Right now I am very concerned over the global warming emails and the implication that data has been changed...How can I teach about global change if scientists are not being honest about their results?”

Reasoning unclear

2009–2011

- “Teaching both perspectives of the issue within time constraints.”
- “More support materials—from both sides of the argument are needed—in order to give this topic the time and depth needed to really inform and educate students.”
- Denialist? Needs PD? Unclear.....

Climate science accepted

2009–2011

- “I am much more confident in my knowledge and the ability to answer student questions, as well as be able to direct students to valid data sites for them to learn to read and interpret the scientific data for their own evidence.”
- “I am learning to rely on the science (evidence) and let the facts speak for themselves.” This makes it easier to present to students...and to other teachers.”
- “I want to objectively present the scientific data that presents climate change is real and an issue of immediate concern.”



What do you hear from
teachers about their barriers
and concerns?

Top Instructional Barriers

- Lack of alignment with standards
- Lack of content knowledge
- Parent, student beliefs

Wise, 2010
ICEE, 2009
CLEAN, 2011

- *Vocal **school board members** have approached administration, claiming that it is not occurring*
- ***Students** have been told that “global warming” is not real and that hurdle is hard to cross sometimes.*
- *It conflicts with my students’ **religion/faith**.*
- *We have some **parents** that do not believe in climate change/warming*

ICEE, 2009

Strategies to forestall controversy

Before instruction:

- Align with standards and curriculum
- Frame for learners' perspective
- Find high quality resources–
evidence/inquiry
- (Maybe) talk with administrators

Strategies to forestall controversy

- During instruction:
 - Employ inquiry, evidence-based pedagogy
 - Controversy as a teachable moment
 - Integrate climate throughout
 - Outside speakers
 - Integrate solutions

ICEE Teaching Videos

CIRES **ICEE: Climate Science Curriculum Development and Integration** **ICEE**

from CIRES Education & Outreach

Acknowledging Your Bias

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"How boring."

I am a geologist...

- The Earth has been around for a long time
- Change is the only constant
- The Earth will go on and life will continue to exist
- My interest in understanding climate change and finding solutions is ...

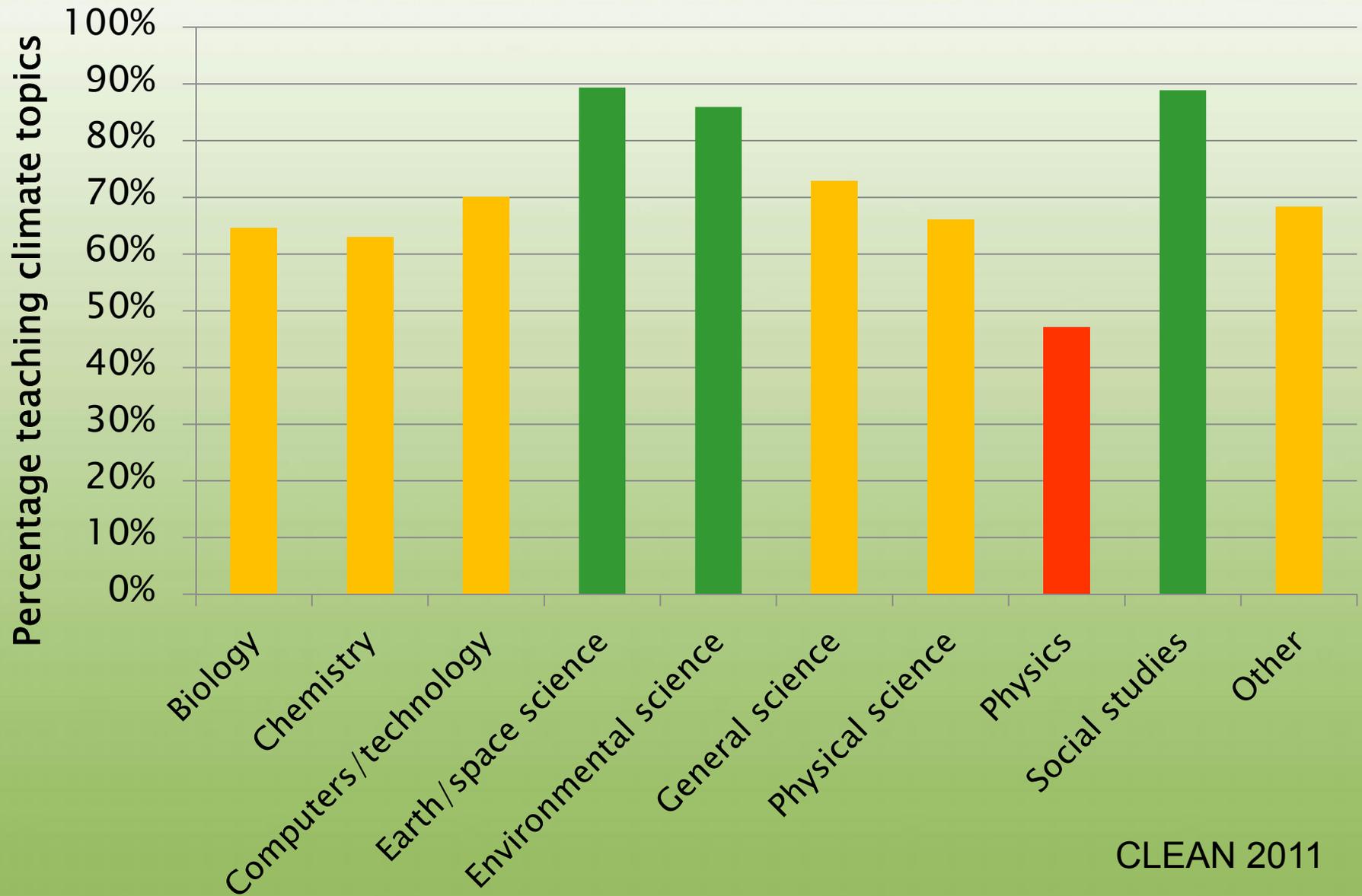
SELFISH!

37:29

vimeo

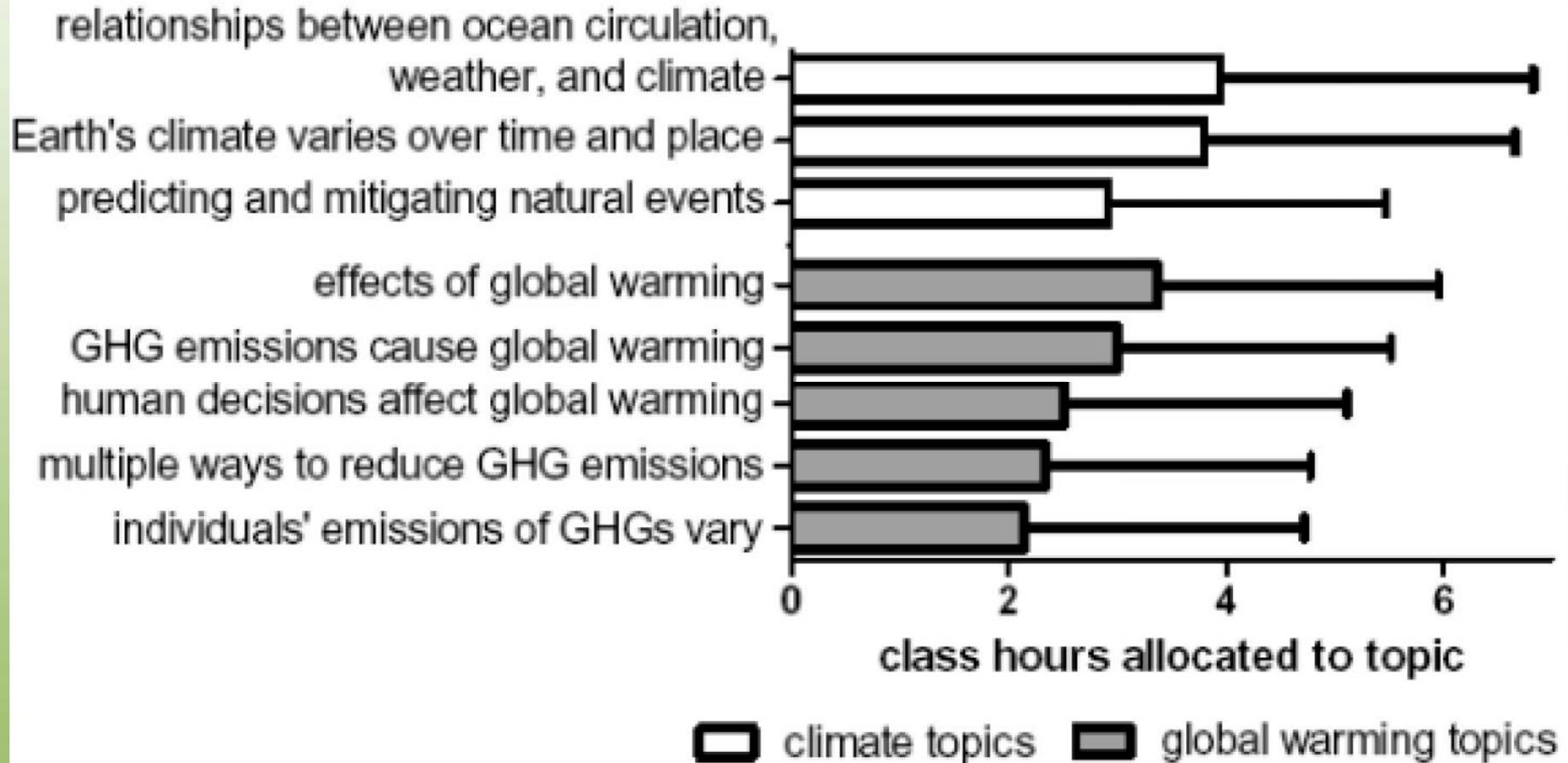
Cheryl Manning, Colorado High School Teacher

Practice: where climate topics are taught



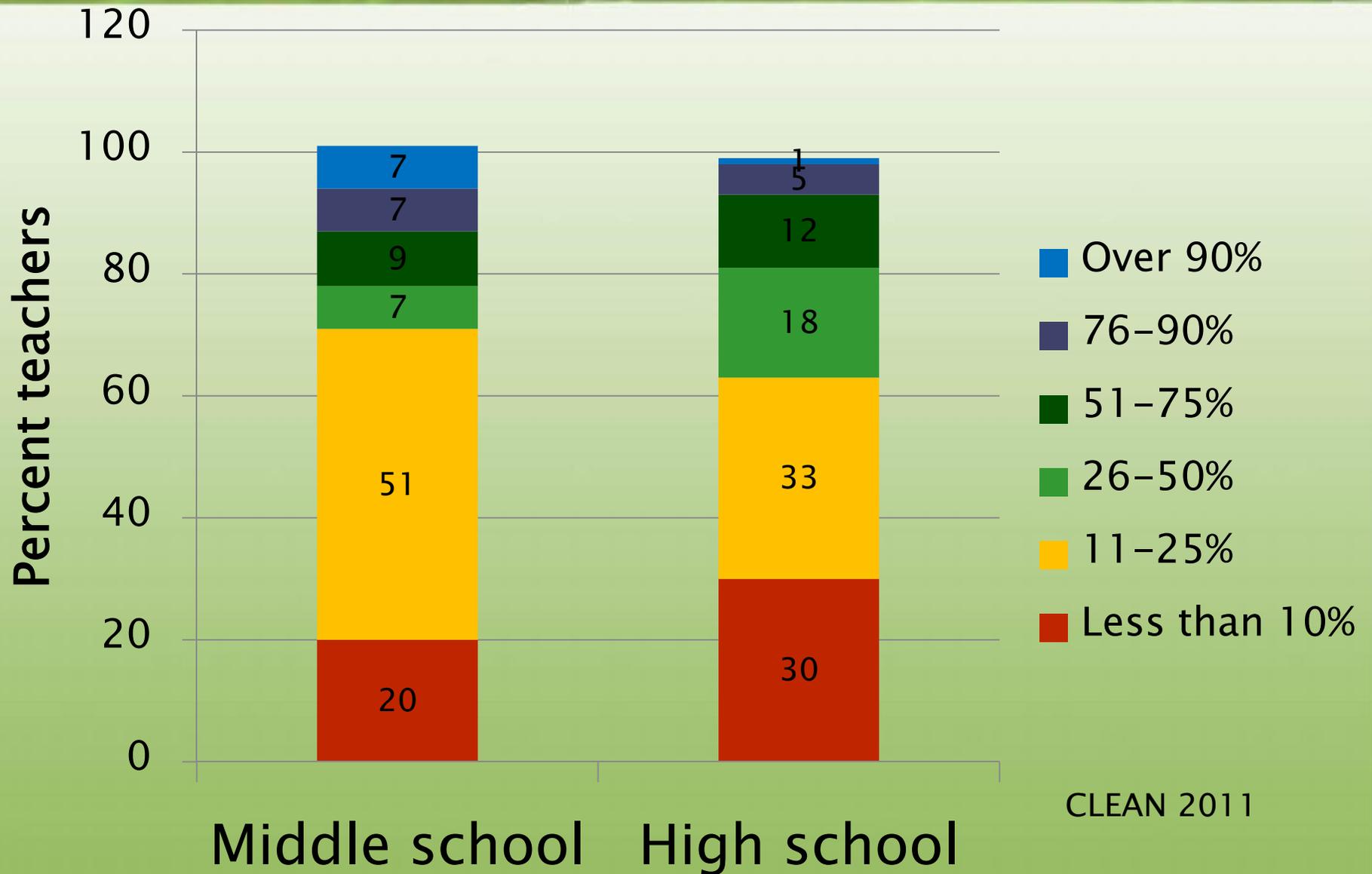
CLEAN 2011

Practice: Time by topic



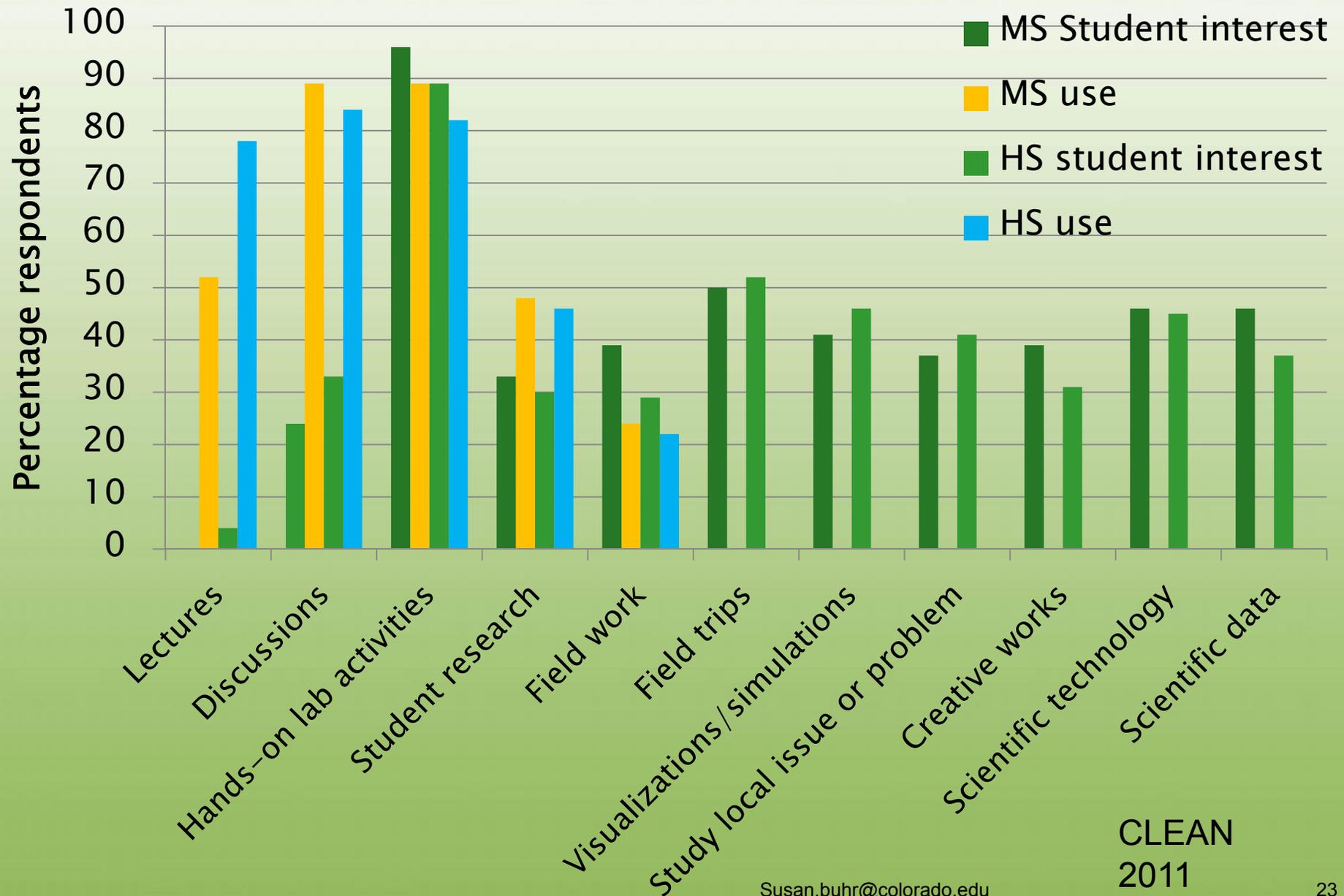
Wise, 2010

Practice: Instructional time for climate



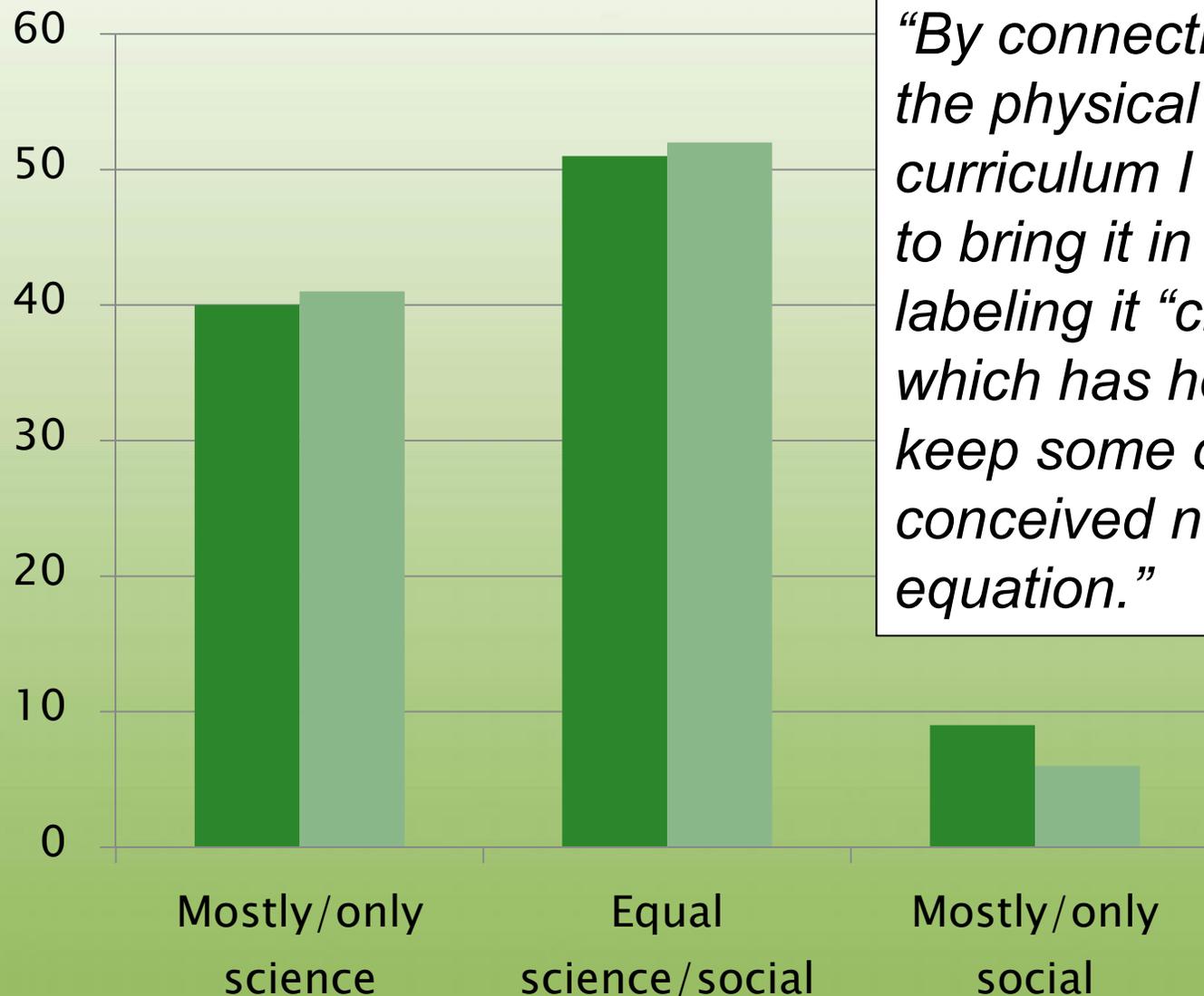
CLEAN 2011

Teaching practice vs. student interest



CLEAN
2011

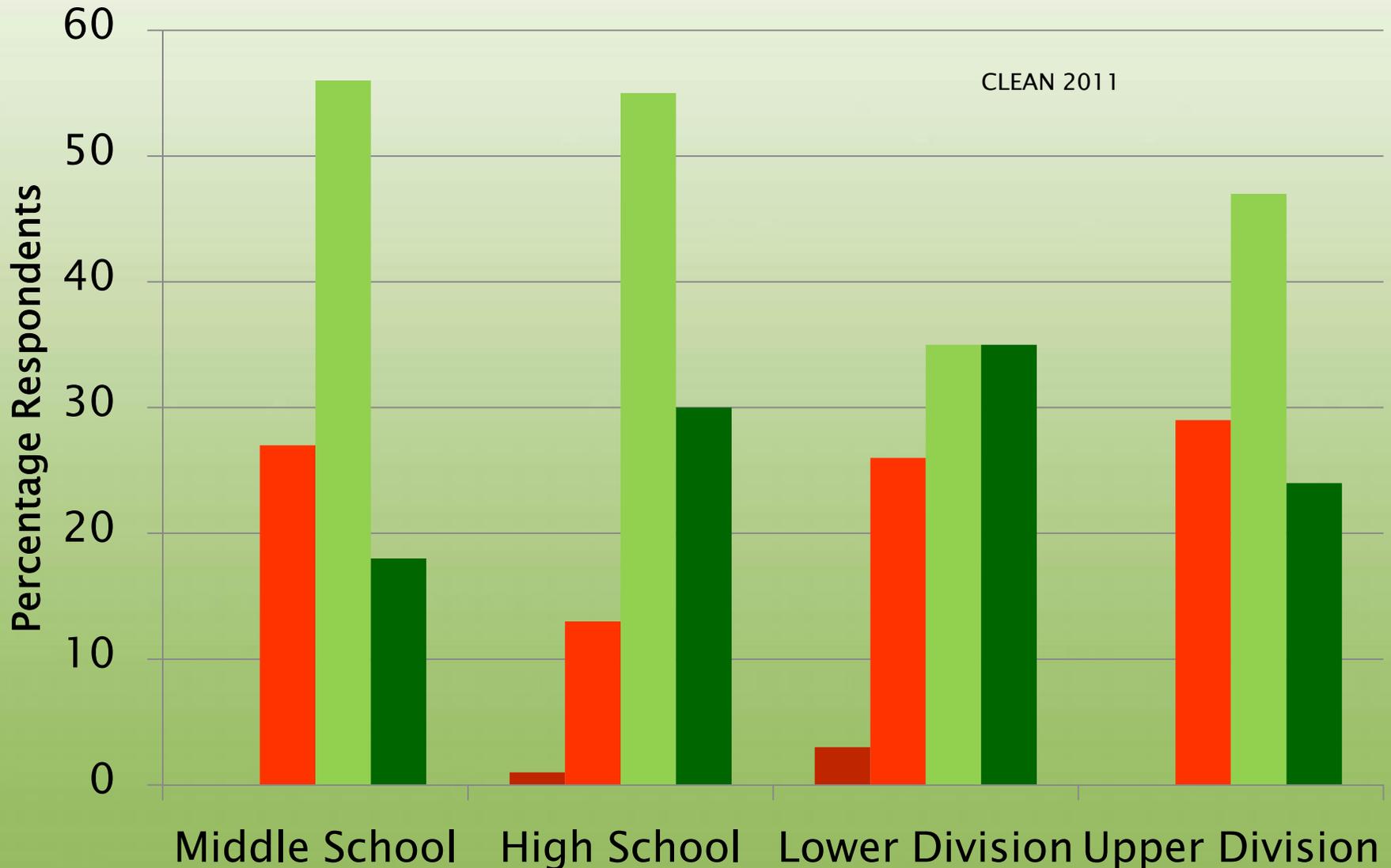
Practices: Integration cross-topic



“By connecting this within the physical science curriculum I have been able to bring it in without really labeling it “climate science” which has helped me to keep some of the pre-conceived notions out of the equation.”

Extent to which solutions are considered

■ Not at all ■ To small extent ■ To some extent ■ To a large extent



Reviewed climate and energy resources

The screenshot shows a Windows Internet Explorer browser window displaying the CLEAN website. The address bar shows the URL http://cleanet.org/clean/educational_resources/index.html. The page features a header with the word "CLEAN" in large green letters, followed by four globes showing different climate data visualizations, and the text "CLIMATE LITERACY & ENERGY AWARENESS NETWORK". Below the header, the page is titled "Educational Resources: Search the CLEAN Collection". A search bar is present with a "search" button. The main content area displays "Results 1 - 10 of 91 matches" and lists several resources with thumbnail images and brief descriptions. On the right side, there are two filter boxes: "Climate and Energy Topics" and "Grade Level". The "Climate and Energy Topics" box lists categories like "Climate System" (23 matches), "Causes of Climate Change" (21 matches), "Measuring and Modeling Climate" (26 matches), "Impacts of Climate Change" (27 matches), "Human Responses to Climate Change" (22 matches), and "Energy Use" (30 matches). The "Grade Level" box lists "Middle (6-8)" (57 matches), "High School (9-12)" (65 matches), "College Lower (13-14)" (23 matches), and "College Upper (15-16)" (7 matches). At the bottom of the browser window, the Windows taskbar is visible with the Start button, several application icons, and the system tray showing the time as 3:24 PM.

CLEAN
Teaching Climate & Energy
Educational Resources
Community
About CLEAN

Educational Resources: Search the CLEAN Collection

Scientifically and pedagogically reviewed digital resources for teaching about climate science, climate change, and energy awareness

Help
Results 1 - 10 of 91 matches

Getting to the Core of Climate Change
<http://sea.earthsci.org/earth-science/teaching-materials/>
This is a lab about evidence for past climate change as captured in ice sheets of Greenland and Antarctica. Students investigate climate changes going back thousands of years by graphing and ...

Seasonal Change on Land and Water
http://www.globe.gov/topic/earth_a_sophan_45_0d72act.c...
In this worksheet-based activity, students review global visualizations of incoming sunlight and surface temperature and discuss seasonal change. Students use the visualizations to support inquiry on ...

Ocean Impacts on an El Nino Event
http://my.sasdata.larc.nasa.gov/preview_lesson_0302passi...
This lesson explores El Nino by looking at sea surface temperature, sea surface height, and wind vectors in order to seek out any correlations there may be among these three variables, using the My ...

Graphing the Extent of Sea Ice in the Arctic and Antarctic
http://www.windows2universe.org/earth/ice/ice_files/01a210...
In this activity, students learn about sea ice extent in both polar regions (Arctic and Antarctic). They start out by forming

Refine the Results

Climate and Energy Topics

- Climate System [23 matches](#)
- Causes of Climate Change [21 matches](#)
- Measuring and Modeling Climate [26 matches](#)
- Impacts of Climate Change [27 matches](#)
- Human Responses to Climate Change [22 matches](#)
- Energy Use [30 matches](#)

Grade Level

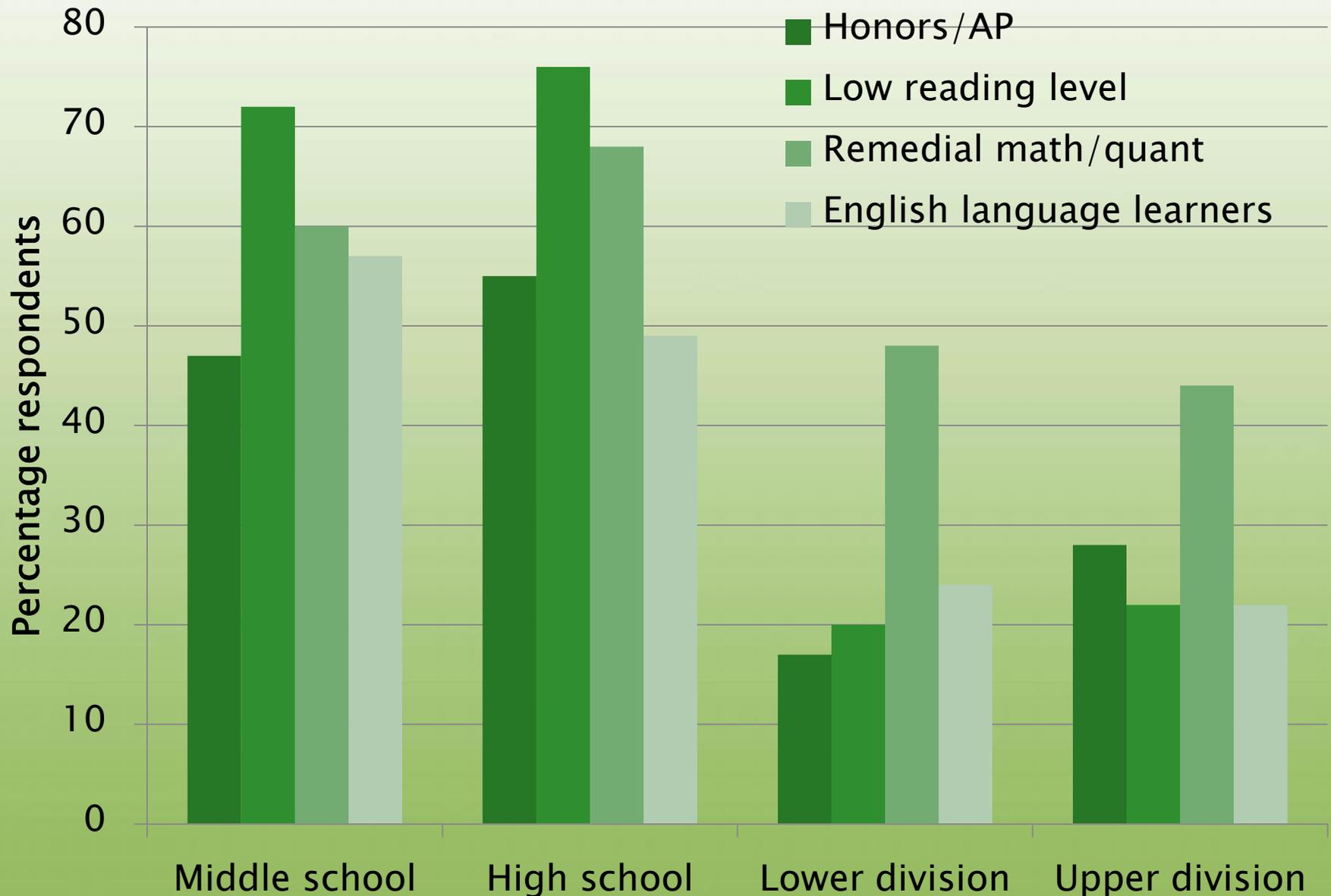
- Middle (6-8) [57 matches](#)
- High School (9-12) [65 matches](#)
- College Lower (13-14) [23 matches](#)
- College Upper (15-16) [7 matches](#)

Other Categories

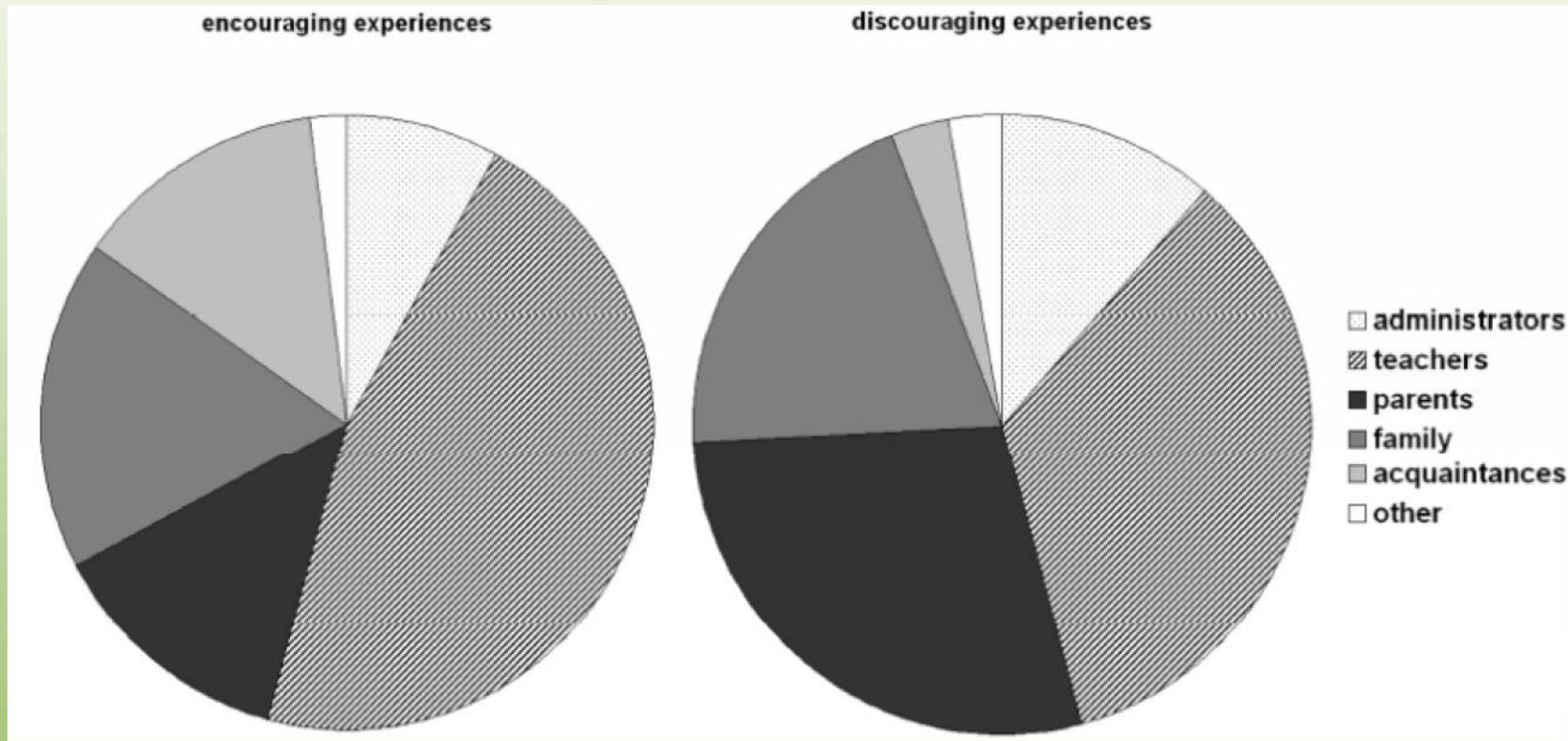
- [Climate Literacy Principles \(add this category\)](#)
- [Energy Awareness \(add this category\)](#)
- [Benchmarks for Science Literacy \(add this category\)](#)

<http://cleanet.org/>

Need better materials

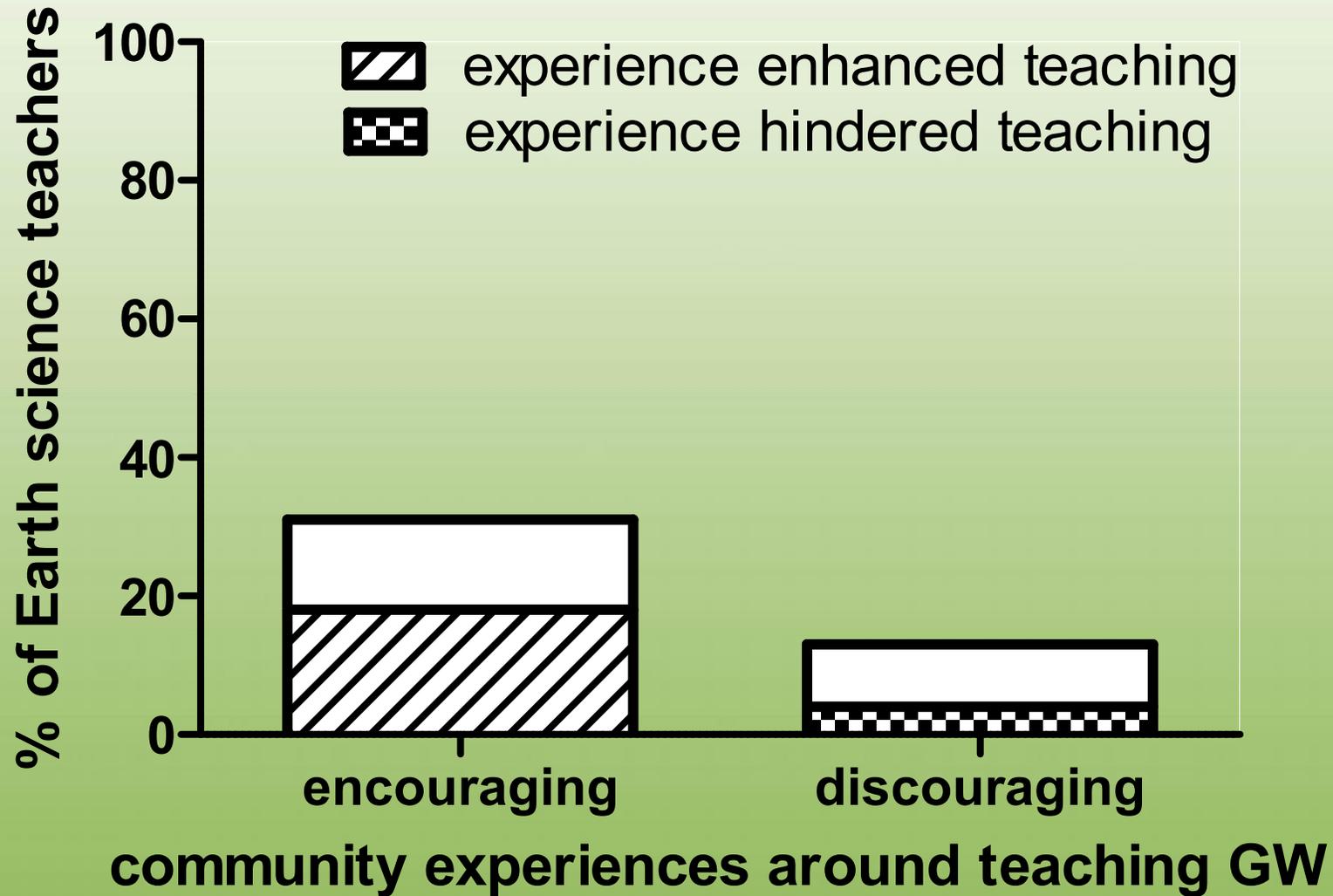


Sources of encouragement



Wise, 2010 JGE

Importance of community



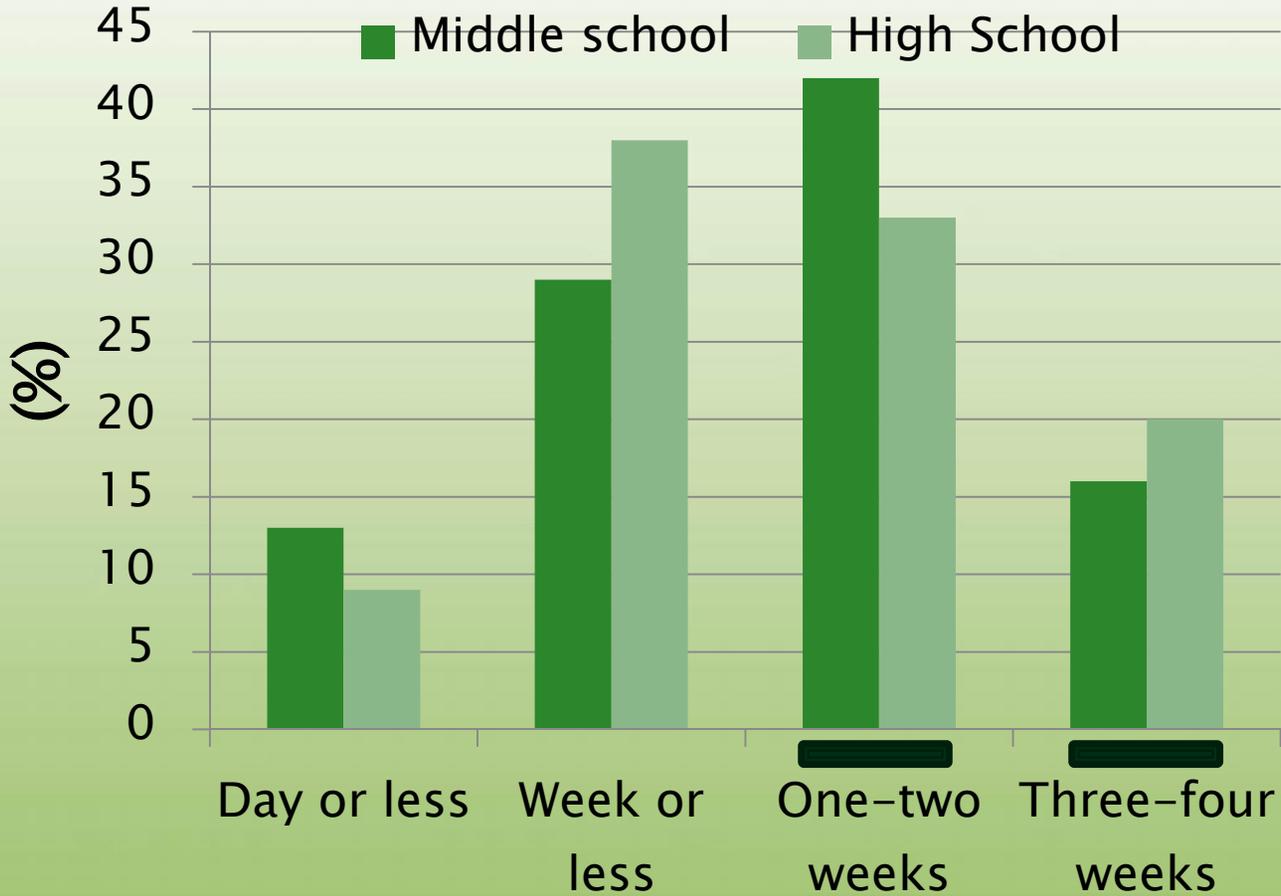
Participation in PD/community

- Most perceive institutional support
- Most perceived as resource by colleagues
- Climate scientist connections
- National science/education communities
- Local/regional communities



**iceeonline.org/forum and
listserve**

Valuable PD: Sustained



Amount PD taken

CLEAN 2011

Professional development opportunities

- Online course ICEE Spring 2012
 - 3 credit grad ENVS or Continuing Ed or nominal admin fee
 - Teaching strategies, Essential Principles Climate Lit, capstone local teaching activity
 - Email susan.buhr@colorado.edu
- CLEAN webinars
 - <http://www.cleantech.org/clean/community/webinars/index.html>
- CLEAN online faculty workshops
 - April 2–14, 2012 – Communicating Climate Science in the Classroom
 - May 7–16, 2012 – Teaching Climate Complexity

Conclusion

Opportunities:

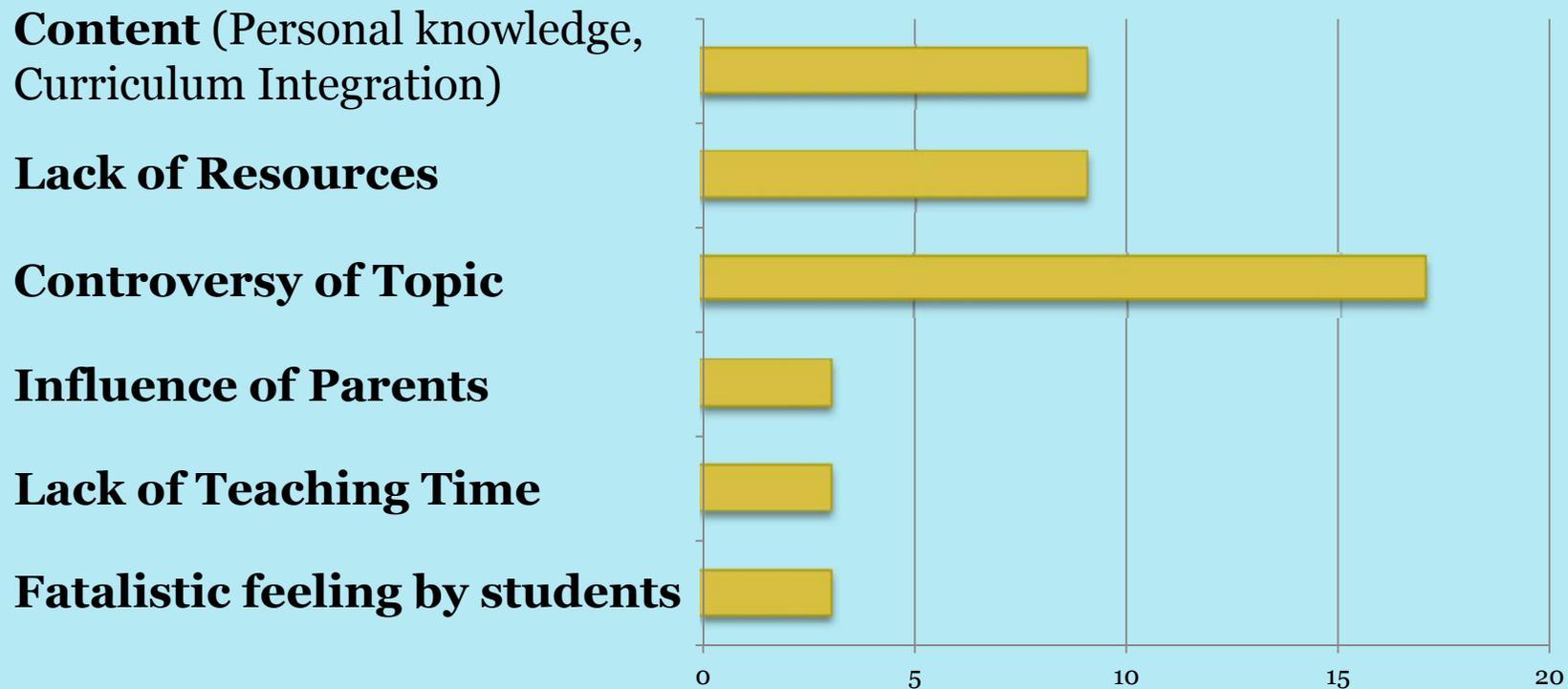
- Reach to all society
- High interest
- Encouragement is effective
- Potential standards alignment

Challenges:

- Persistent controversy
- Lack of alignment with standards
- New topic for most

Spacer between presentation and other slides

Question: If you have tried or considered teaching climate change in your classroom, **what kinds of challenges have you come up against?**



Learn more about climate survey among Colorado teachers 2011, N=53

Challenges: Earth Science in H. S.

