team

PYXIS *(pik·sis)*

Spring Presentation
April 26, 2011

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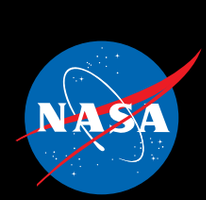
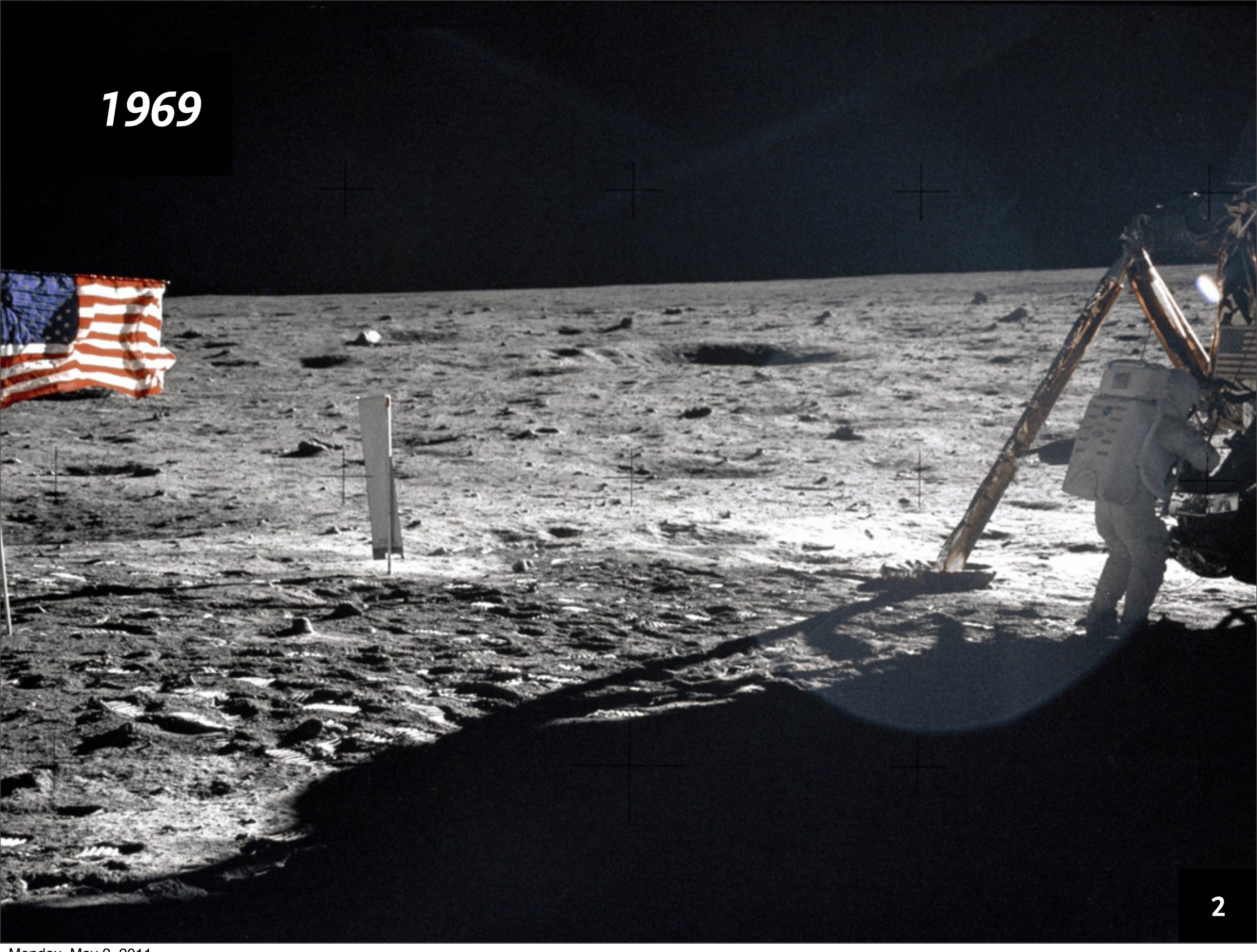
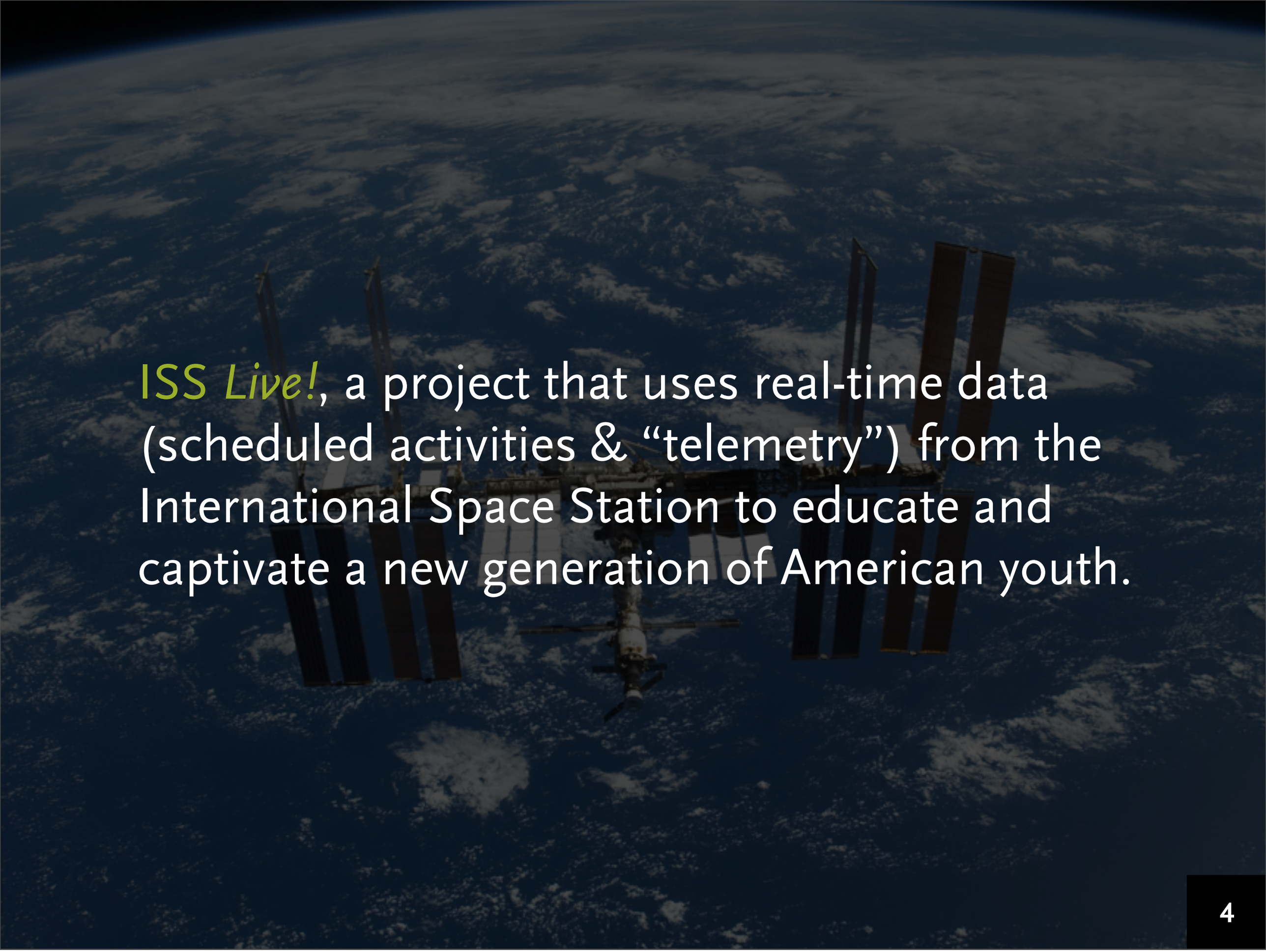


Carnegie Mellon University


1961


1969

2011



ISS *Live!*, a project that uses real-time data (scheduled activities & "telemetry") from the International Space Station to educate and captivate a new generation of American youth.

1960s

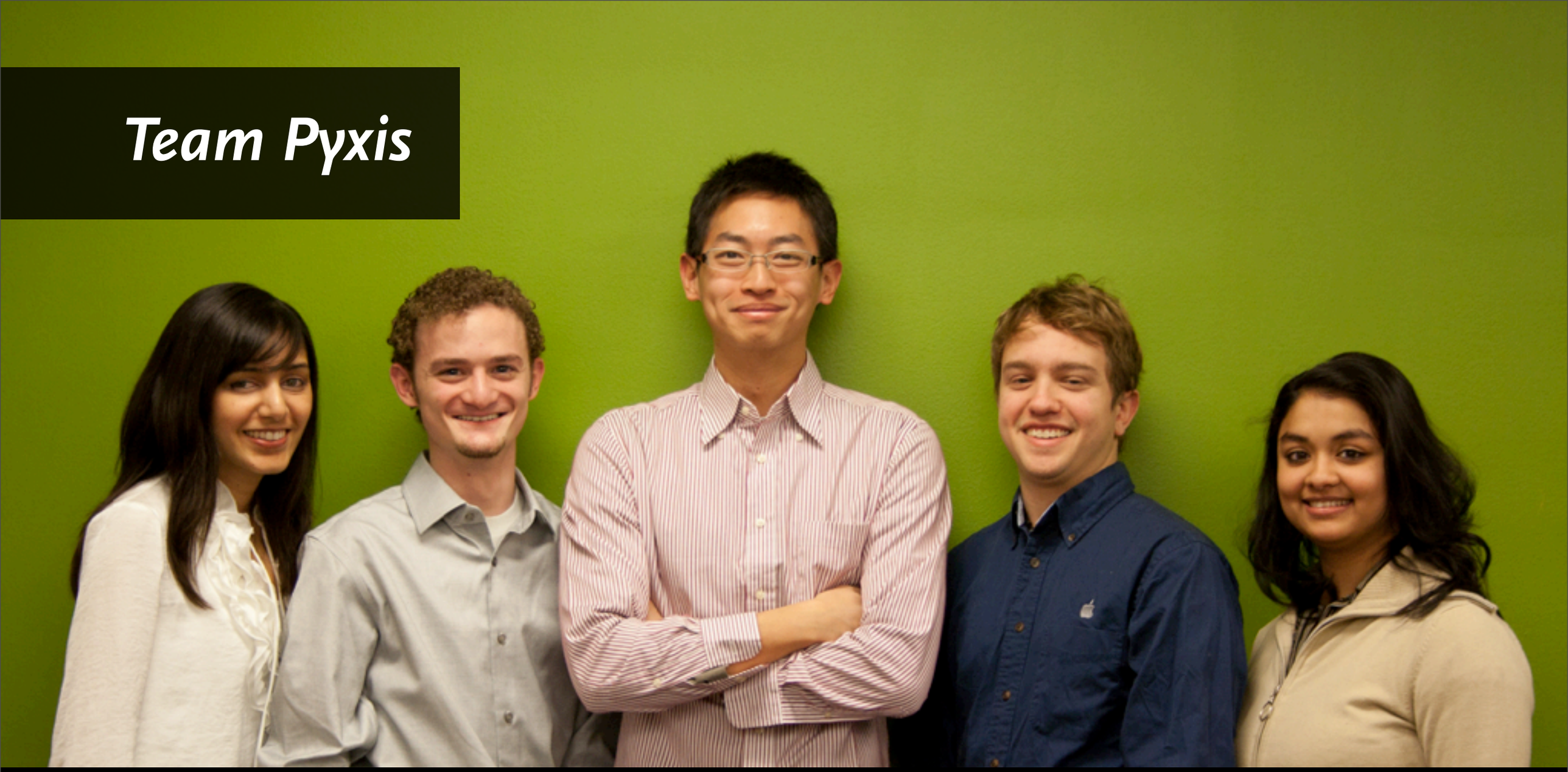
2011


AT&T
Account
7:18 PM
facebook
51%
Search
Inbox
Profile
Chat
Friends
19
31
Events
Notifications

"[Seeing Apollo] galvanized me to want to be an astronaut... I knew I was going to have to be pretty educated. That's why I really believe in your project: y'all can do that for poor [kids] out there that don't have a vision..."

– Dan, telemetry expert

Team Pyxis



Nisha Kurani
Co-Project Manager

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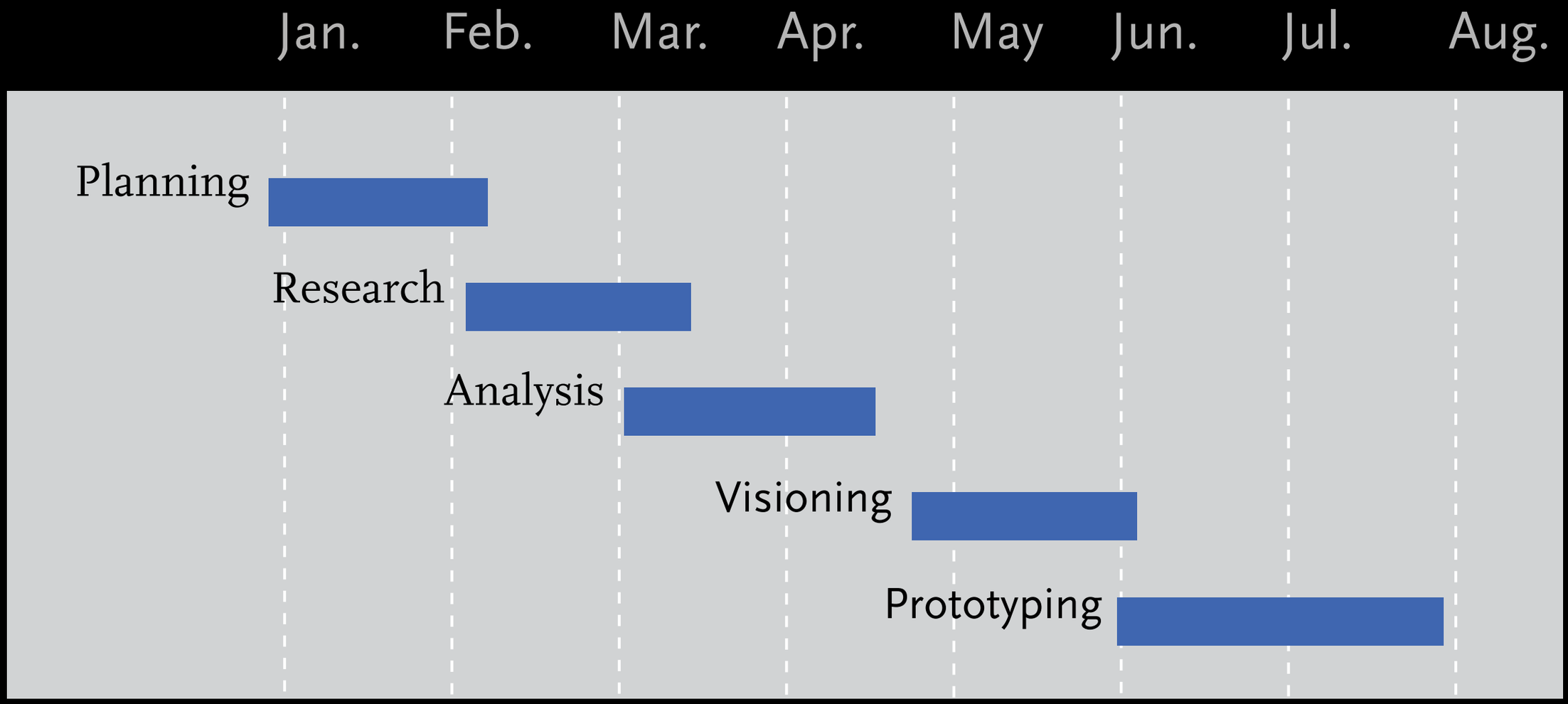
About the HCII

Carnegie Mellon's Human-Computer Interaction Institute is dedicated to research and education in topics related to technology that supports human activity. The two-semester capstone project connects teams of masters students with industry sponsors.

Project Schedule



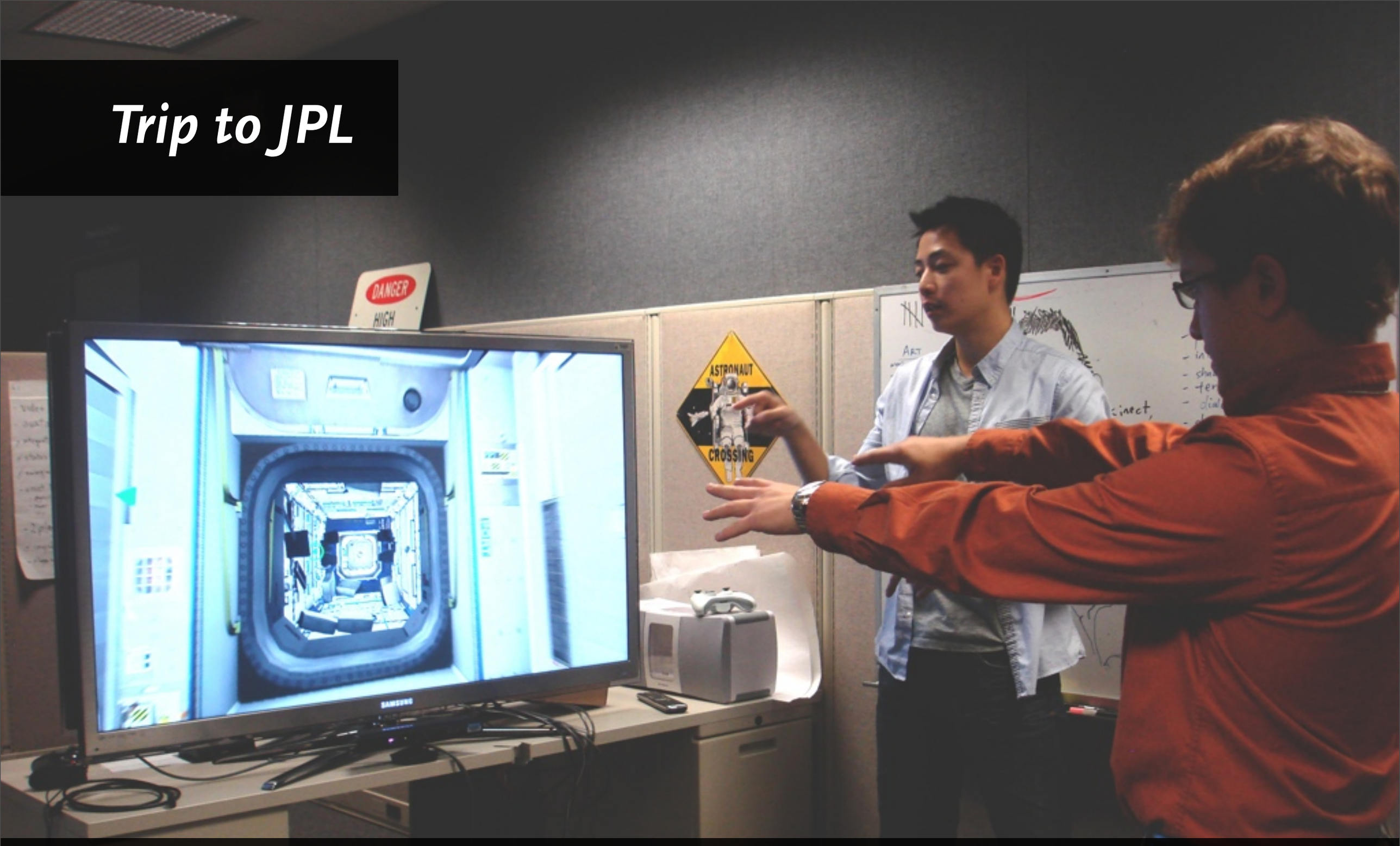
Spring Process

1. Background Research
2. Field Research
3. Insights
4. Visioning
5. Next Steps

1

Background Research

Trip to JPL



Met the ISS Live! team to understand the goals and context of the project.

Literature Review

37 articles, talks, and books.

Learning Theories

Connect old and new knowledge, provide realistic situations and social interactions

Engagement Theories

Use social influence, reduce barriers to engagement, use the power of action

Educational Technologies

Promote participatory learning, let user performance speak to effectiveness

Platform-Specific Design

Different mediums have different advantages

Competitive Analysis

PRODUCT / VALUE CRITERIA	Usability (Heuristic Evaluation)	Immediate Engagement	Accessibility	Novelty	Data Visualization	Interactivity	Community/Social Interaction	Incentives to Return	User-generated Content	Price	User Rating (out of 5.0)
NASA HD	○	◒	◒	○	○	◒	◒	○	○	Free	3.5
Eyes on the Solar System	●	◒	●	●	●	●	○	○	○	Free	N/A
Star Walk	●	●	◒	●	●	●	○	●	○	$4.99	4.5
Solar Walk	◒	●	◒	●	●	●	○	○	○	$2.99	4.0
The Elements	●	●	◒	●	●	◒	○	○	○	$13.99	4.0

● = high
◒ = moderate
○ = minimal/none

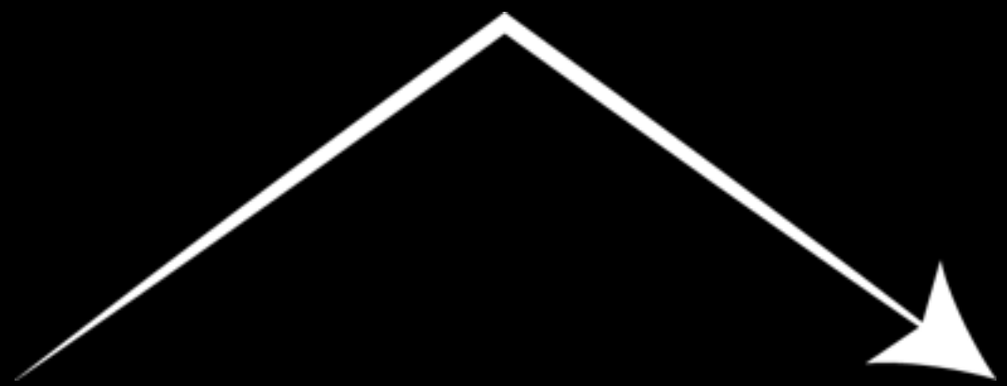
2

Field Research

Research Demographics

Educators

How do they craft content/use tools to communicate?



NASA

What are their goals and objectives?

Students

What are their goals, needs, and desires? What motivates them?

Research Demographics

13 flight controllers

NASA

23 students

high school

college

4 high schools

school type

private
public

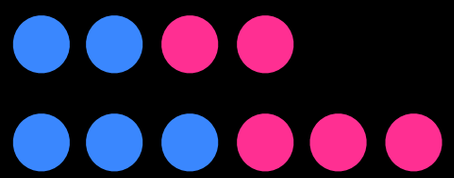
median income

high
low

10 educators

teachers

NASA



7 space enthusiasts

various

53 total

Flight Controllers

Contextual Observation: observe the practice of flight controllers using scheduling systems.

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Activity Affinity: understand which ISS activities happen most frequently and which are most exciting.

Flight Controllers

Contextual Observation: observe the practice of flight controllers using scheduling systems.

Activity Affinity: understand which ISS activities happen most frequently and which are most exciting.

Interviews: uncover the reasons behind flight controllers' passions for space.

Students

Postcard Drawing Activity: discover what students know about space.

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Background Interviews: learn how they use smartphones/schedules, and talk about their interest in space.

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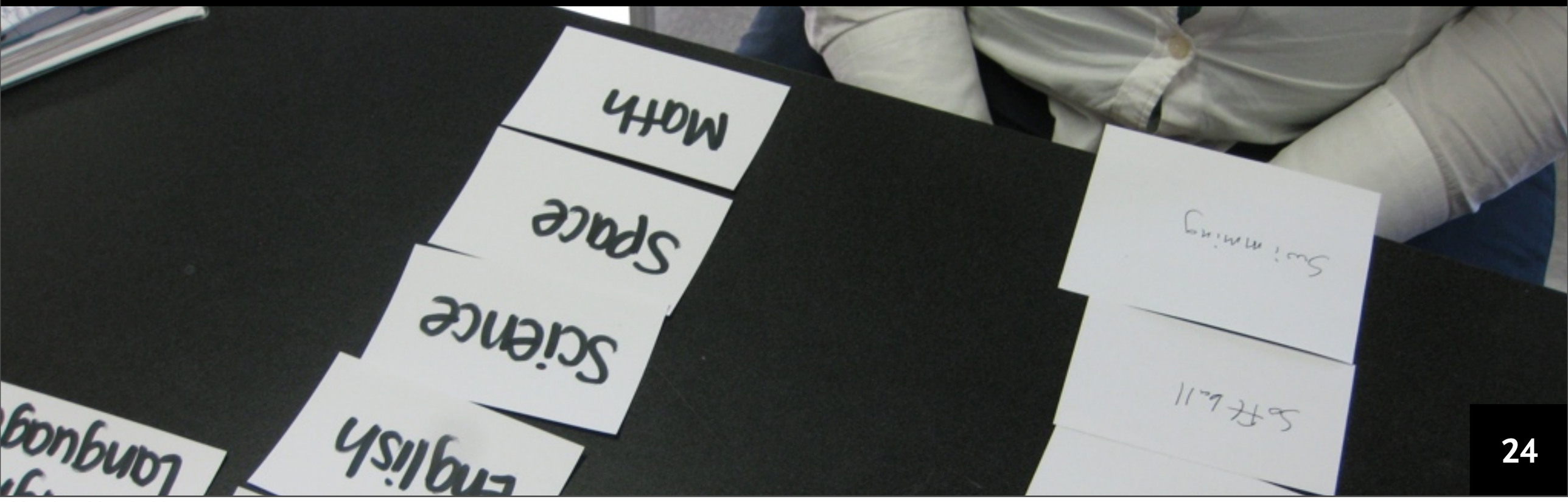
Background Interviews: learn how they use smartphones/schedules, and talk about their interest in space.

Card Activities: understand what's interesting to students about space and their daily activities/classes.



Students

Postcard Drawing Activity: discover what students know about space.

Background Interviews: learn how they use smartphones/schedules, and talk about their interest in space.

Card Activities: understand what's interesting to students about space and their daily activities/classes.

Contextual Thinkaloud: uncover how students discover new educational applications and evaluate their usefulness.

Teachers

Classroom Observation & Interview: learn how teachers engage students in the classroom.

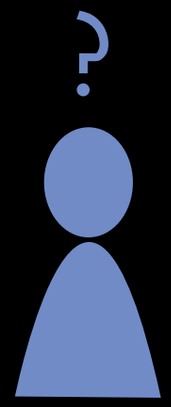
Reflection

- Interviewing enthusiasts
- Iteration on research
- Accessing public schools
- Balancing demographics

3

Insights

1
Captivate Students' Attention



2
Provide a Visceral Experience

3
Relate it to their World

4
Manage Interruptions

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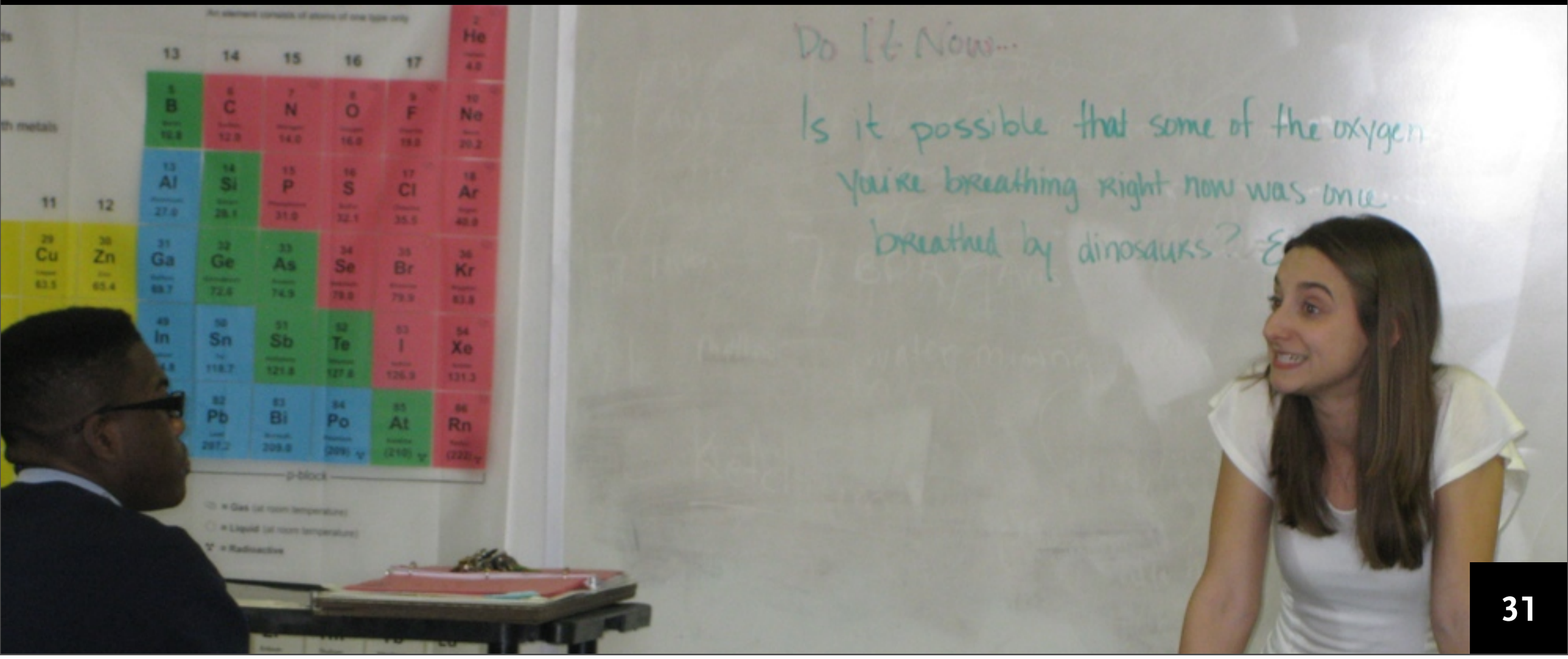
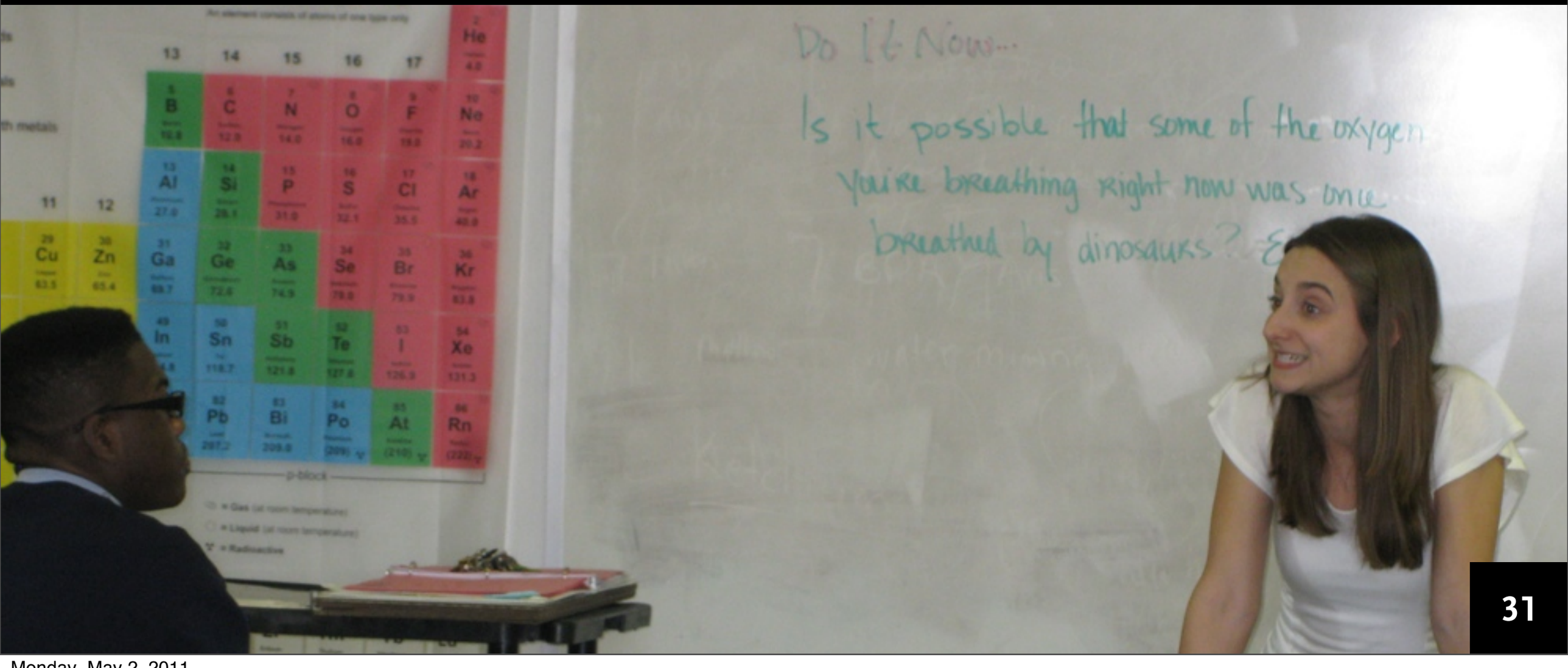

Do It Now...
Is it possible that some of the oxygen
you're breathing right now was once
breathed by dinosaurs?
He
B
C
N
O
F
Ne
Al
Si
P
S
Cl
Ar
Cu
Zn
Ga
Ge
As
Se
Br
Kr
In
Sn
Sb
Te
I
Xe
Pb
Bi
Po
At
Rn
13
14
15
16
17
11
12
p-block

Captivate Students' Attention

Curiosity arises from familiar topics with a new twist.

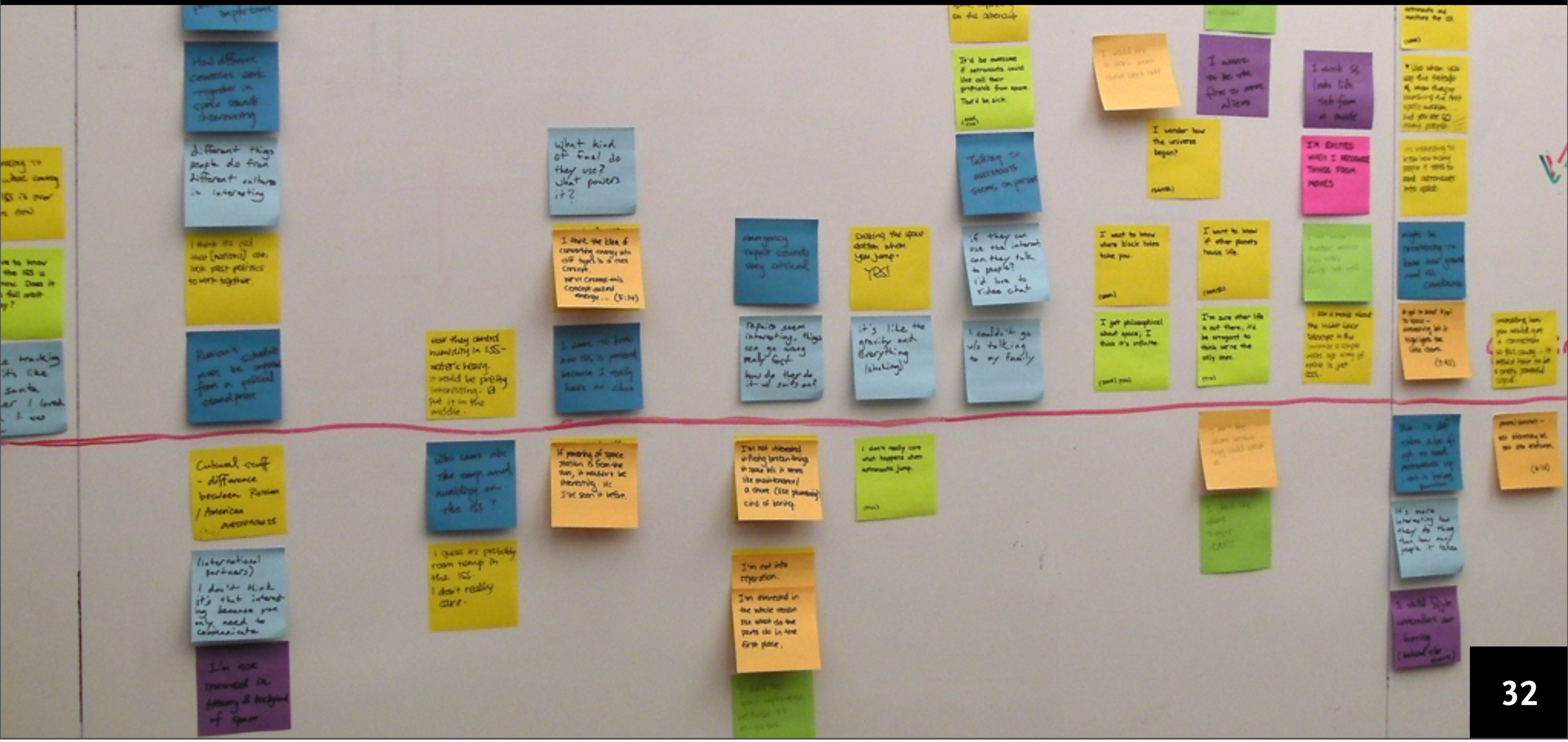
All four teachers introduced new topics with a catchy question, image, or activity that built on what students already knew.



Captivate Students' Attention

Student have diverse interests.

Activity card results showed that students have different levels of knowledge and enthusiasm to learn about space and science.

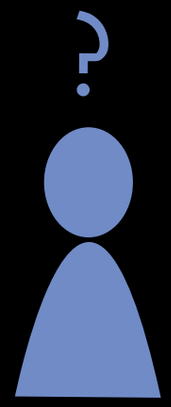


Captivate Students' Attention

Visuals universally attract attention.

All students sought out visuals, commenting that the appearance and layout of websites and applications affected their impression of the content.

1
Captivate Students' Attention



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Provide a Visceral Experience

Hierarchy of information facilitates browsing.

Students explored information layer by layer, true per the advice of NASA outreach and industry web designers.

Provide a Visceral Experience

Hands-on presentations of content were almost universally successful.

"We all look forward to this class all day... it's hands-on, not like math, which is a bunch of problems."
– Alexis, 11th grader

Provide a Visceral Experience

Science experiments onboard the ISS intrigue students and flight controllers.

Card-sorting activities revealed that more than half of students and flight controllers found science experiments on the ISS interesting.

Provide a Visceral Experience

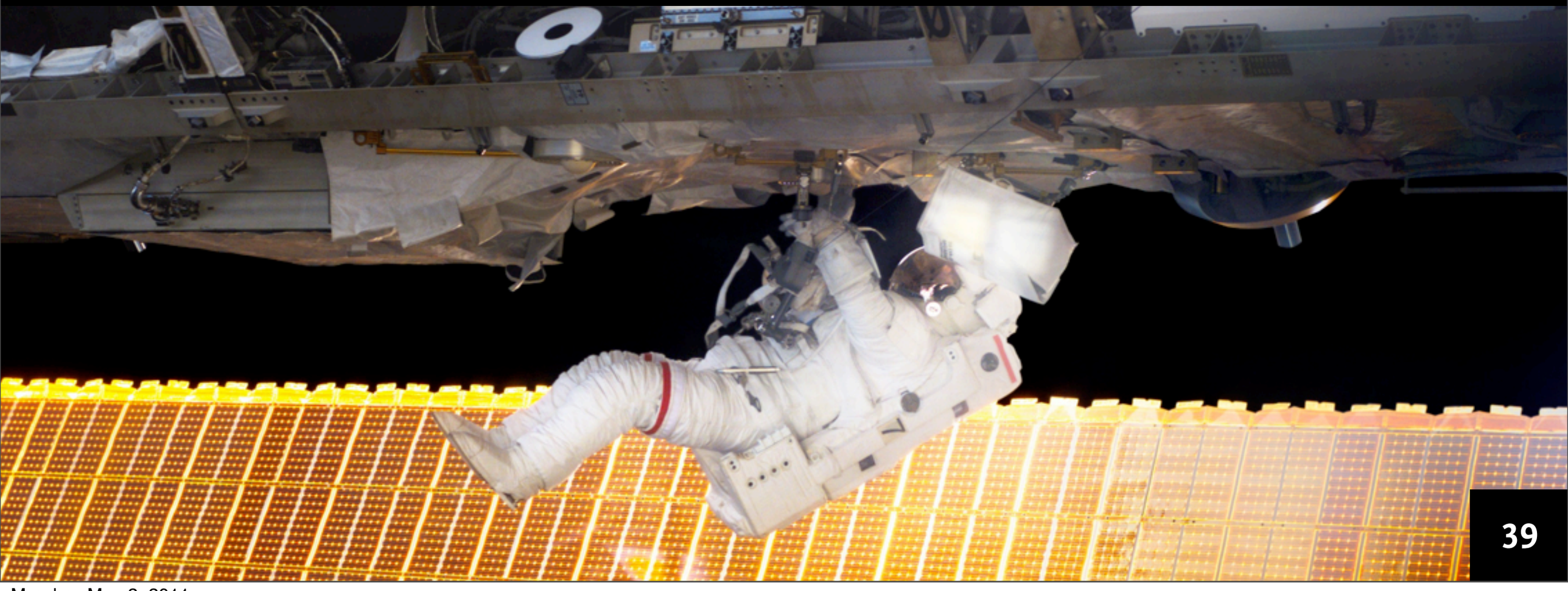
Students want to know how things work and what it's like in space.

"When people think about space, we think about space walks and stuff... We don't think about how they exercise or what they do in their free time, like board games."
– Ashwin, 11th grader

Provide a Visceral Experience

Emotion adds excitement and increases memorability.

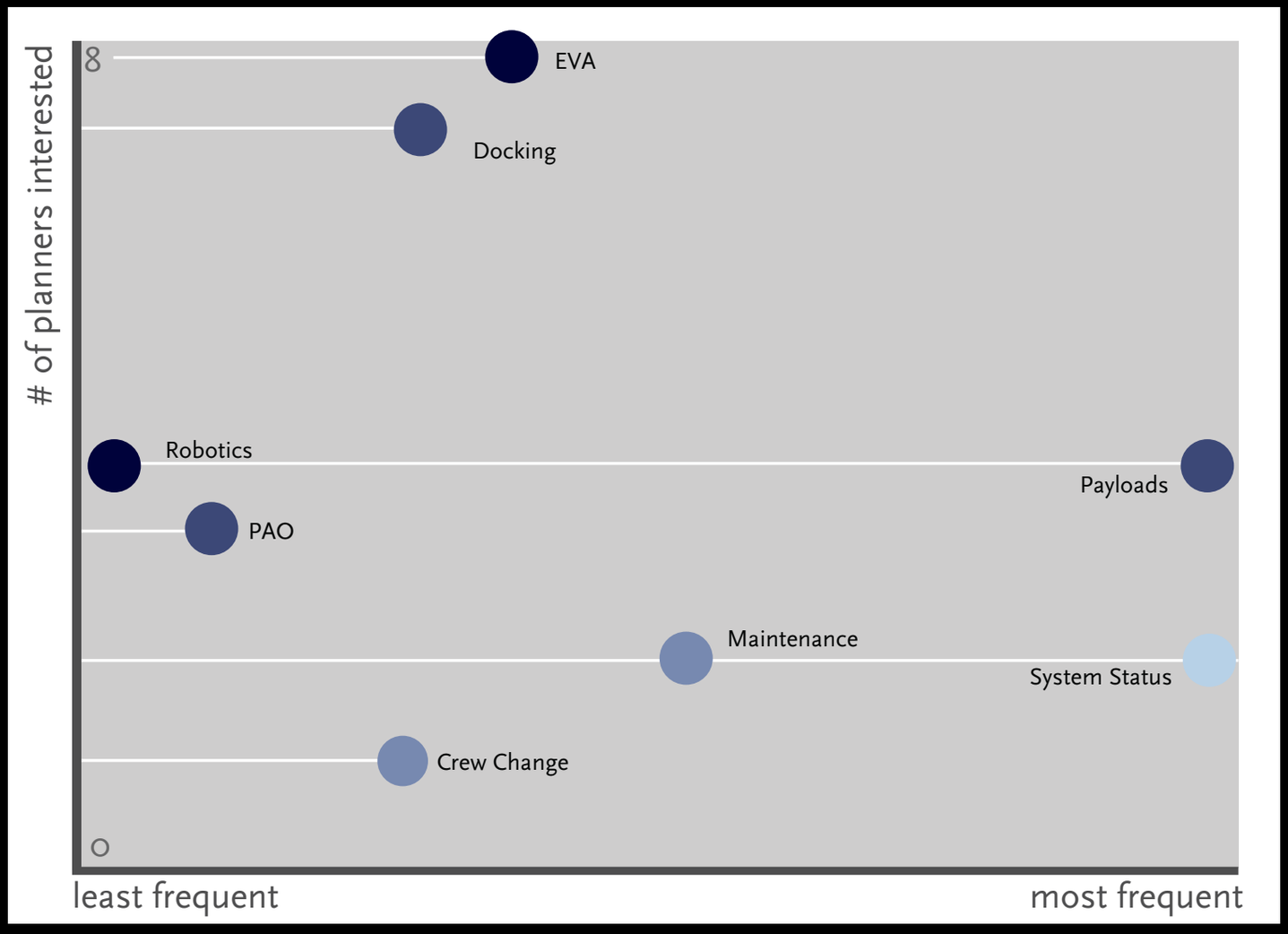
"We had a major failure of the Russian computing systems on the ISS... we were losing battery power to the Soyuz. If we didn't have a solution in eight hours, we'd have to abandon the space station."
– James, flight controller

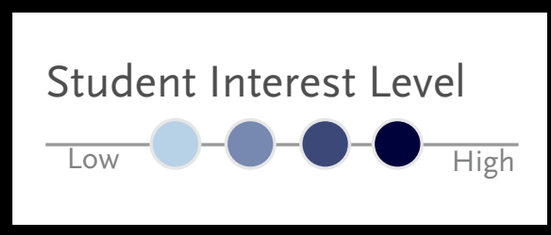


Provide a Visceral Experience

High-risk and critical activities are most interesting.

Of all activities, EVA and docking missions garnered the most interest from both flight controllers and students.





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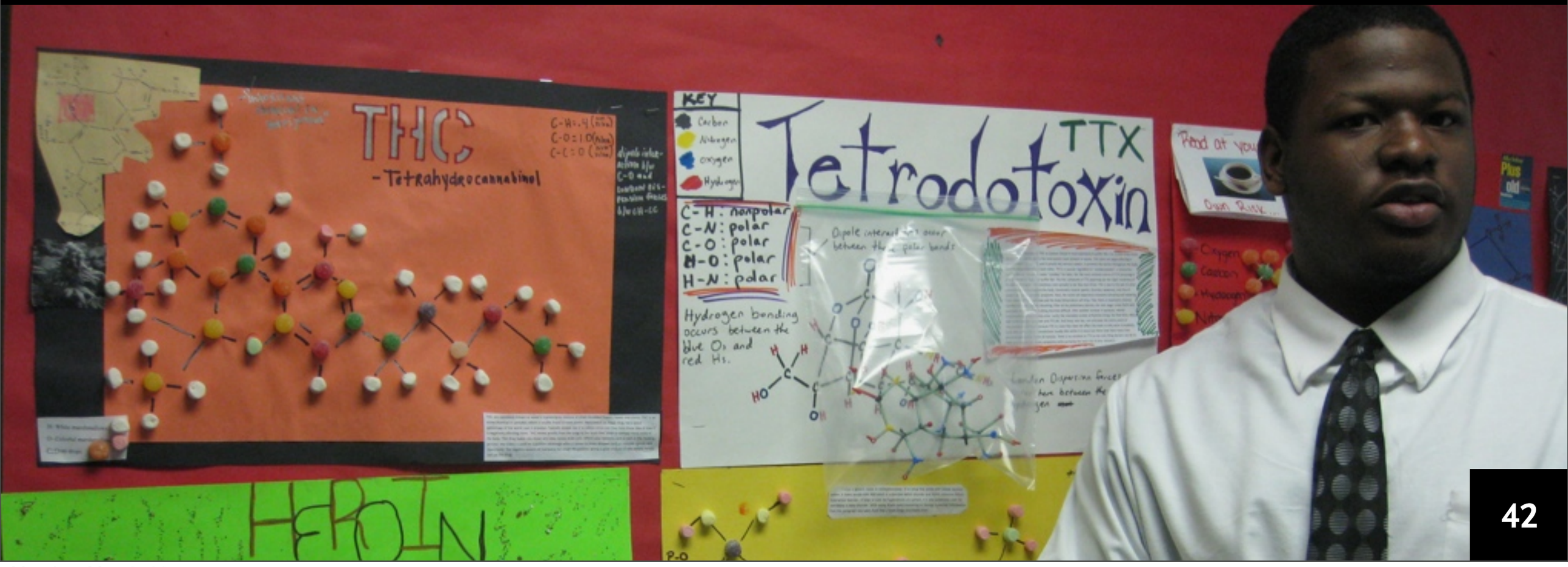
Relate It to Their World

Familiarity facilitates interest.

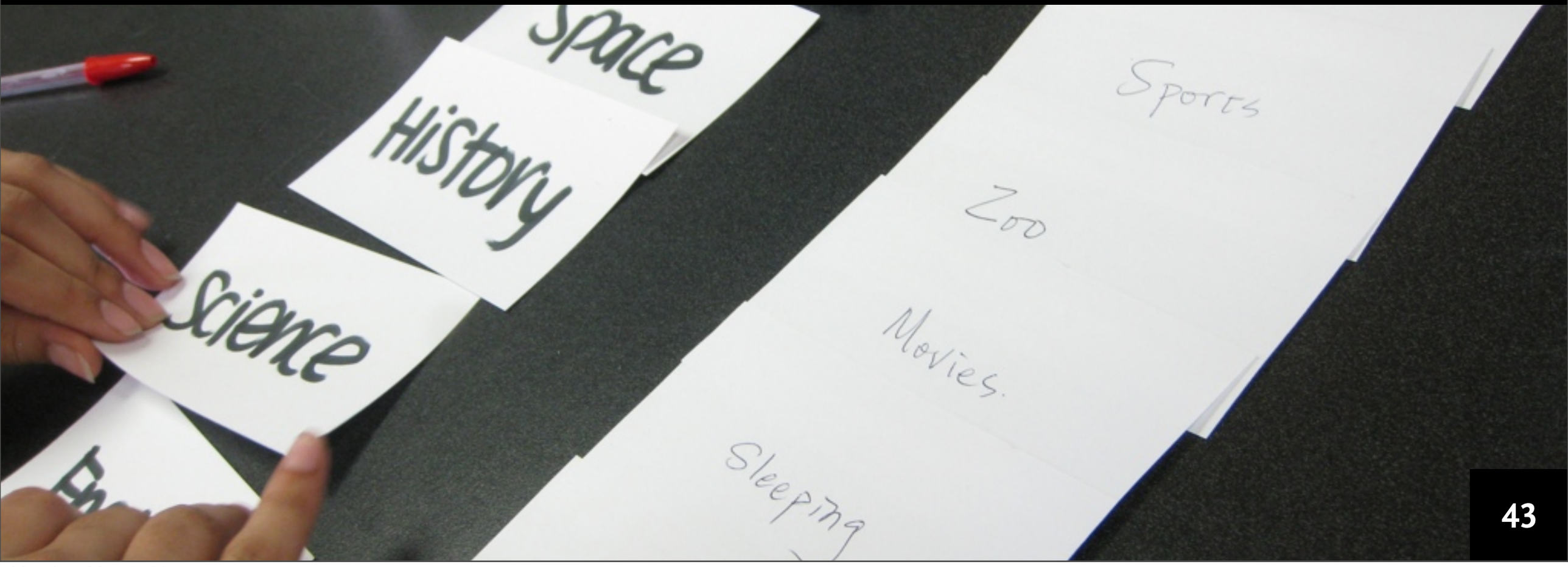
"So you could look at amino acids from biology and you could even go deeper in chemistry and look at the different chemicals and whatever that compose it, and then you can go even deeper in physics and talk about what kind of bonds there are and what are the forces acting on the molecules and everything is really connected."
– Isaac, 12th grader



Relate It to Their World

Students want to see the value in what they are learning.

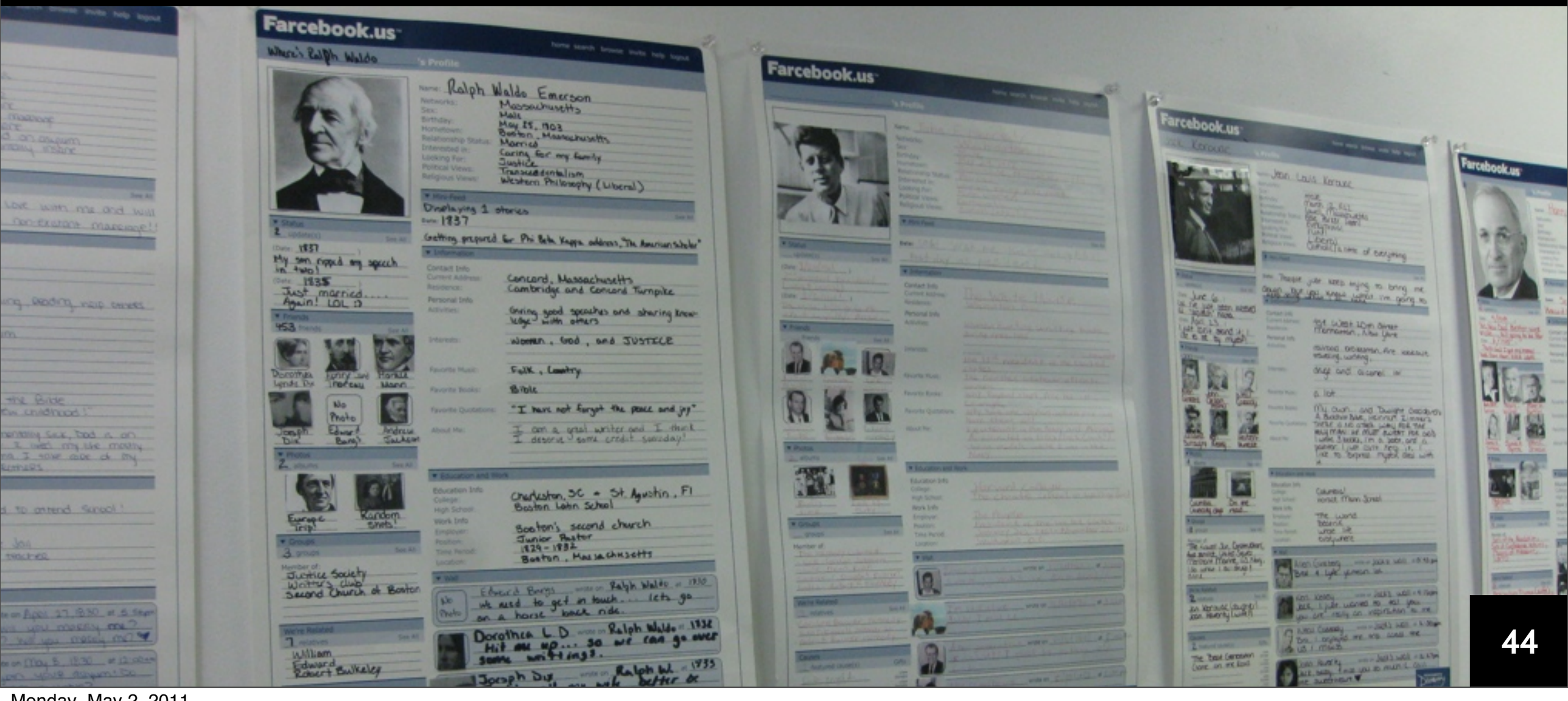
"[Theory class] also can seem kind of pointless, like in the end you're kind of just arguing of meaningless stuff, and it doesn't really matter, so it is like a good thing to take with you, but it's not really like useful."
– Daniel, 11th grader



Relate It to Their World

Different perspectives enrich the story.

"Because it's US History and I'm from Germany. I can see all the history, like WWII, from a different perspective."
– Till, 10th grader



Relate It to Their World

Camaraderie resonates with students and flight controllers.

"I think it's cool that [nations] can look past politics to work together."
– Bryanna, 10th grader

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Manage Interruptions

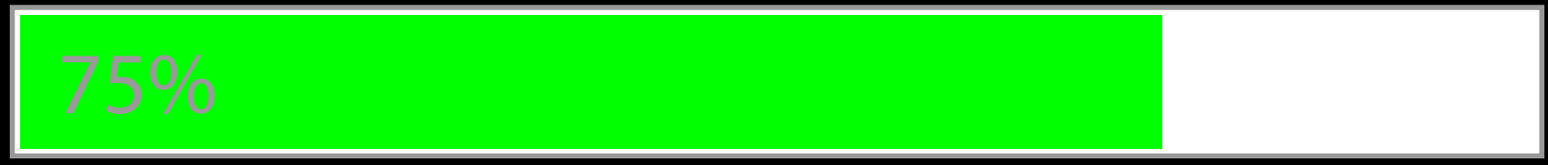
Adapting to the environment reduces impact of disruption.

Mobile design takes into account context of use, short attention span, and is designed for interruptibility.

Manage Interruptions

Immediate engagement keeps users interested.

When load times exceeded expected wait times, students preferred to move on to other tasks.

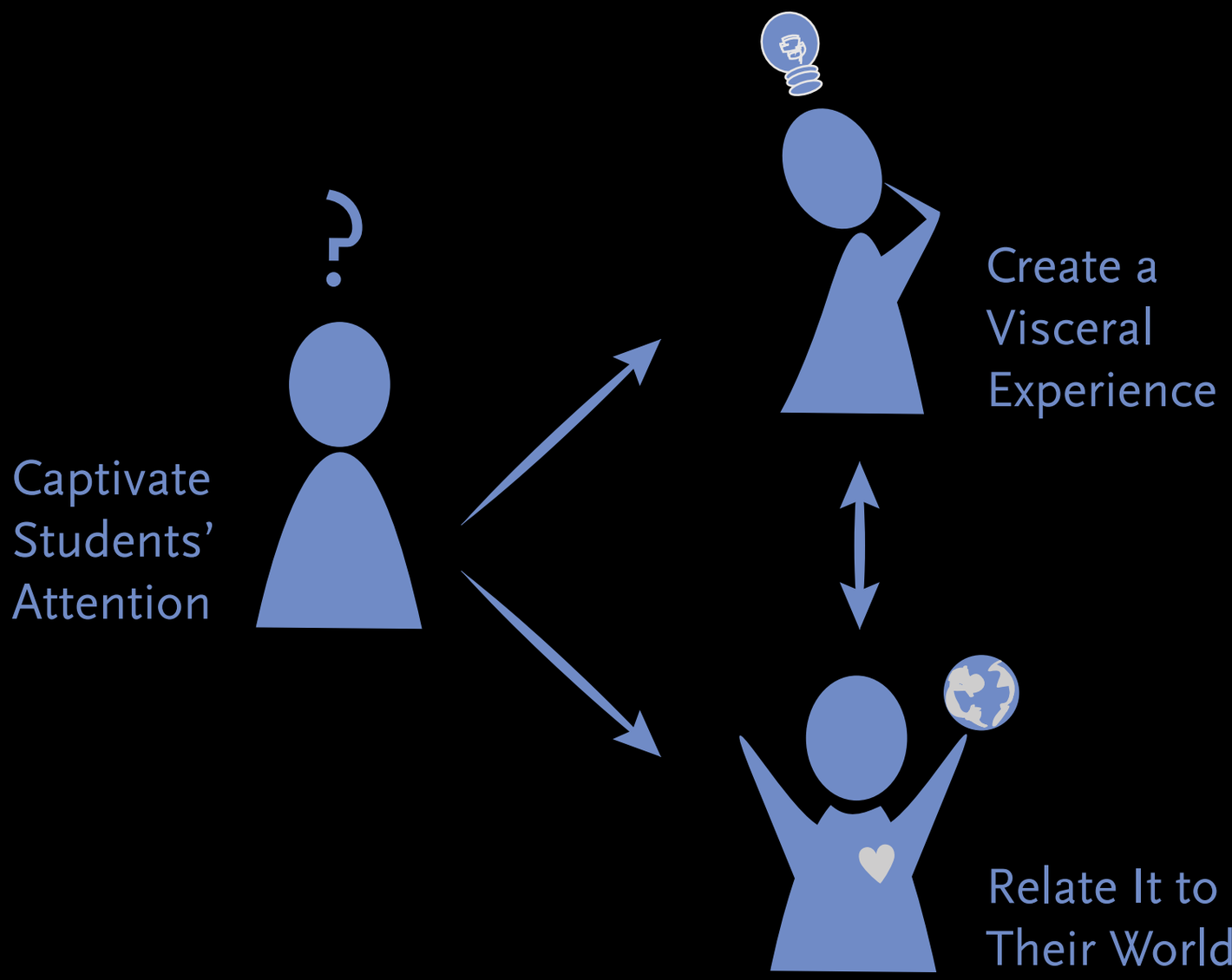


Manage Interruptions

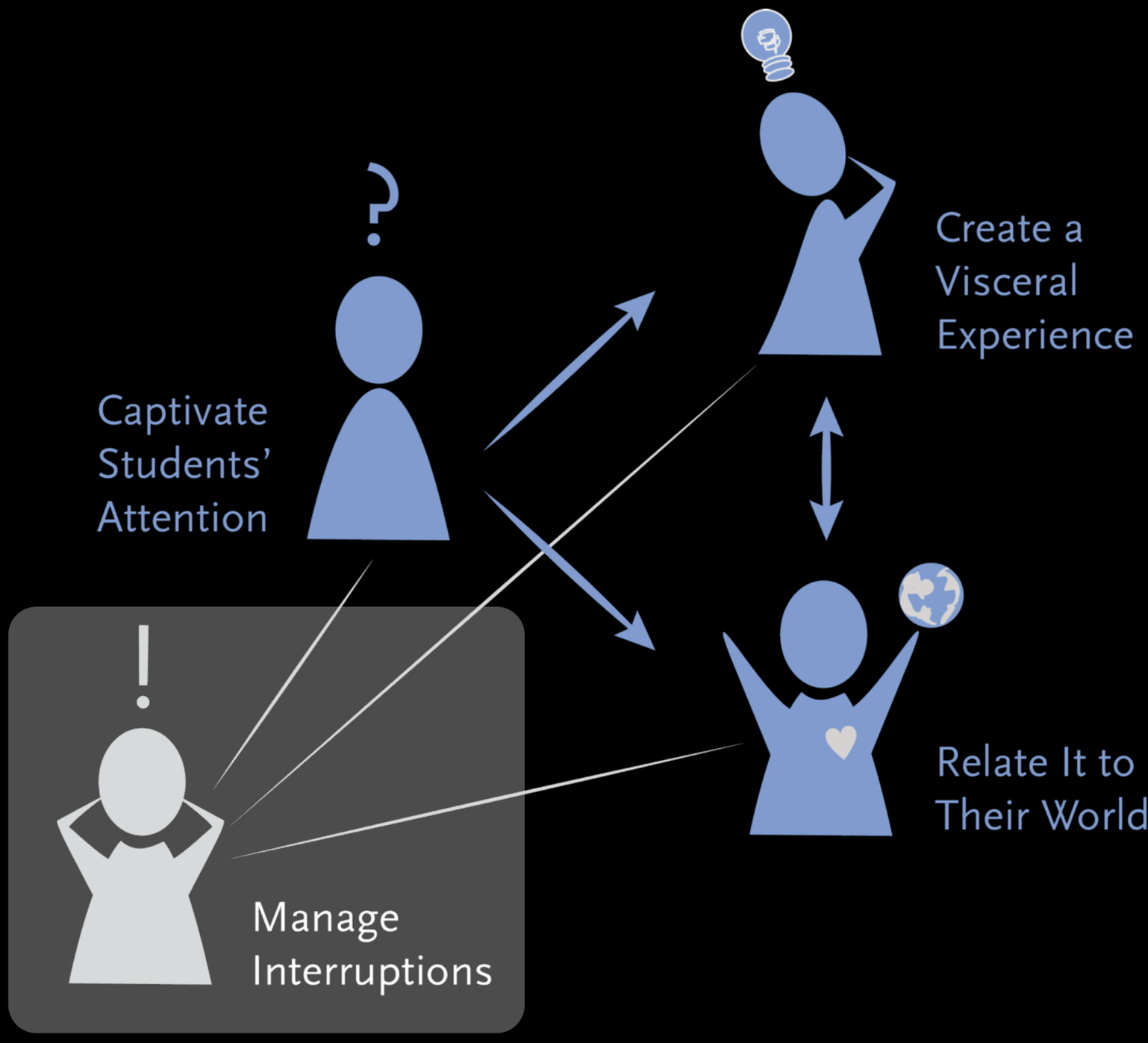
Users in control of their experience are more likely to stay engaged.

Agency increases user's interest in participation.

Insight Relationship



Insight Relationship



4

Vision

Personas

Mapped research participants to three different archetypical students:

Faith Hudson (primary)
Steve Brown (secondary)
Taylor Jordan (secondary)

Faith Hudson

"Dad keeps bugging me to figure out what I want to study in college. I have no idea though. It's really stressful..."

High-school junior: applying to colleges soon, but doesn't know what she wants to do.

Stopped learning about space in elementary school, but gets excited by it.

Loves chemistry (hands-on) and playing games/tutoring little kids at the Boys & Girls Club (she learns from them).

Steve Brown

"Space is just really cool: black holes, antimatter, the existence of aliens and stuff... there's so many unanswered questions out there, so many more things for us to discover."

College freshman: electrical engineering and physics.

Went to space camp and has loved space since; enjoys deep questions about the universe.

Plays video games and basketball, and is joining the astronomy club.

Taylor Jordan

"Math is terrible; no matter how much I study, I still get bad grades. I like biology, though... I'm actually doing pretty well in it."

High school sophomore.

Loves soccer because of her teammates and friends.

Not really interested in space, and really hates math; never got good at it or gained any confidence with it. Unlike other sciences, loves biology (doesn't involve math and she's pretty good at it).

Visioning Process

Generated over 70 ideas.

These are meant only as talking points to generate a conversation and are definitely not final.

What if...

...scheduled ISS activities were shown in a personalized, dynamic, and educational way?

Personalization can tailor the application to each student, bringing the parts they are more interested in to the forefront.

Dynamic, educational content that parallels school work can build on the material students already know.

What if...

...we could use a virtual, hands-on approach that borrowed from augmented reality or gaming?

Augmented reality could allow students to browse data in a more immersive way while connecting ISS work to their world.

Games can reinforce learning while making an application more interesting and help drive repeat usage.

What if...

...we can enhance the collaboration amongst peers to fulfill a shared learning experience?

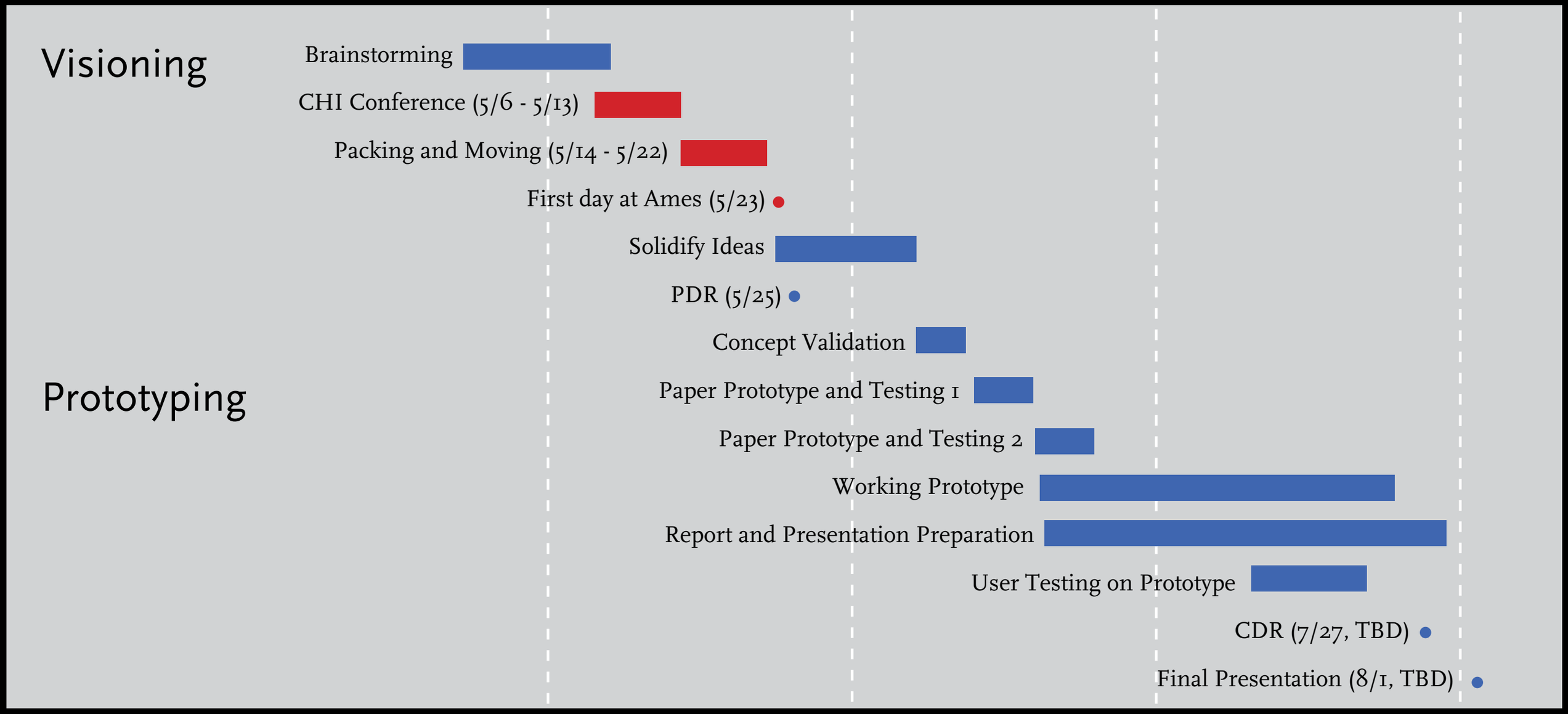
Collaboration allows students to work together, giving them a greater sense of purpose and encouraging prolonged usage.

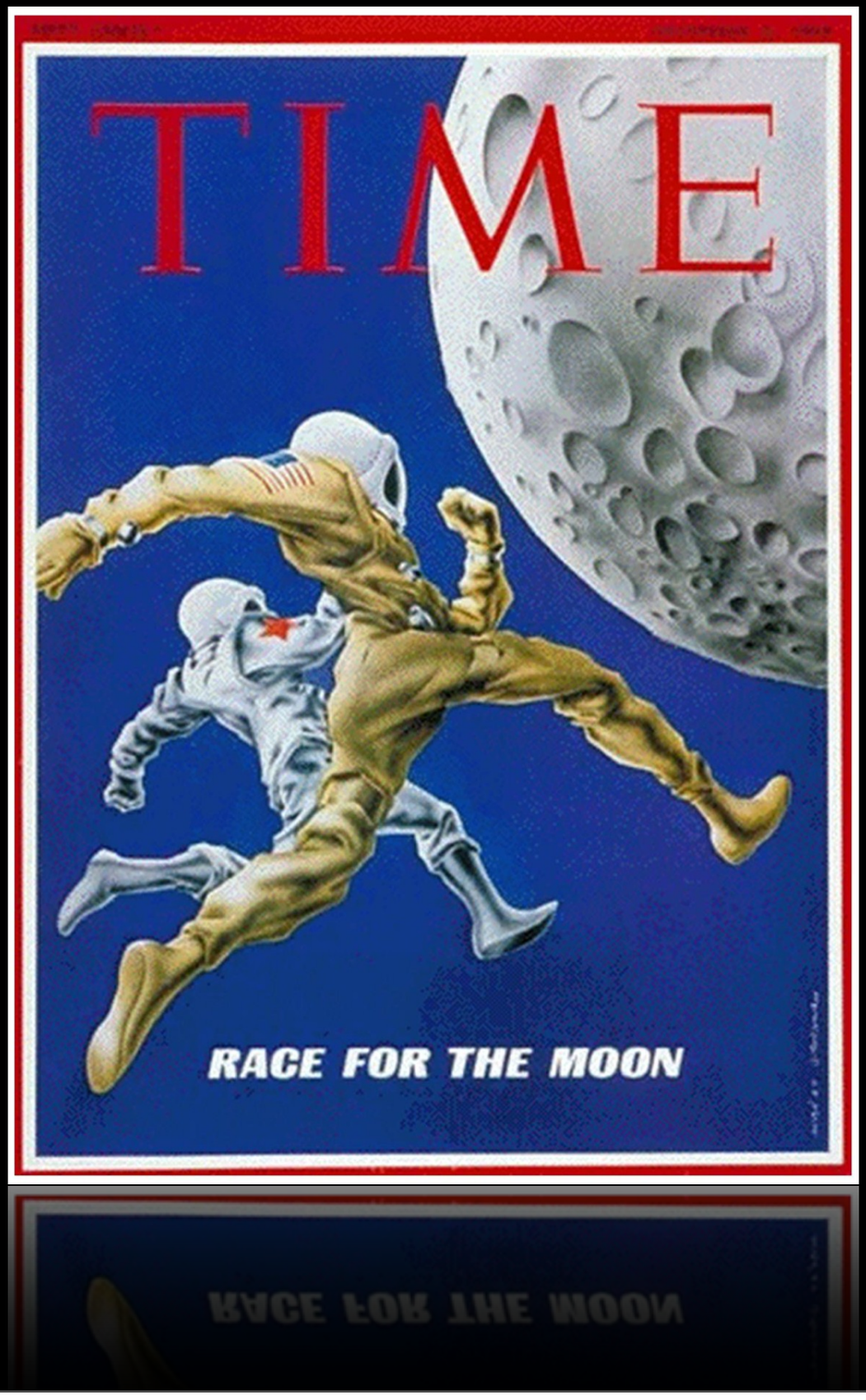
Contribution back to NASA might help students feel involved while helping the application directly meet their expectations.

5

Next Steps

Summer Schedule




TIME
RACE FOR THE MOON

?

Q&A