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ORANGE COUNTY CONVENTION CENTER

ORLANDO, FLA

www.FETC.org

Augmented Reality in Education: Present Accomplishments, Future Visions

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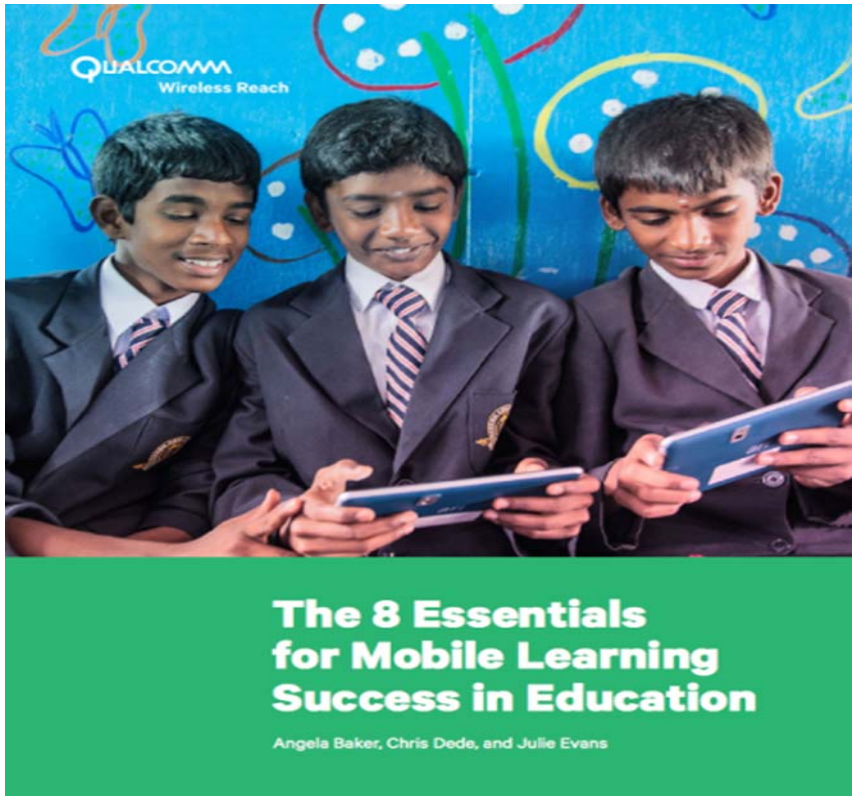
Augmented Reality in Education: Present Accomplishments, Future Visions

Today's Discussion:

- About Augmented Reality in Education
- Case Study: EcoMobile
- Case Study: School in the Park
- Case Study: STEAMing Ahead with Mobile Learning
- A Glimpse into the Future
- Your Turn: your questions, comments, ideas



QUALCOMM Wireless Reach™

Paper includes:

- Lessons learned from 7 K-12 mobile learning projects from around the globe

QUALCOMM
Wireless Reach™

New paper examines:

- 8 Essentials for Mobile Learning within higher ed context
- Includes examples from 5 higher ed projects

Join the discussion

@Chrs_Dede
@JulieEvans_PT

About Augmented Reality in Education

Situated Learning and Transfer

Guided authentic experiences in and out school

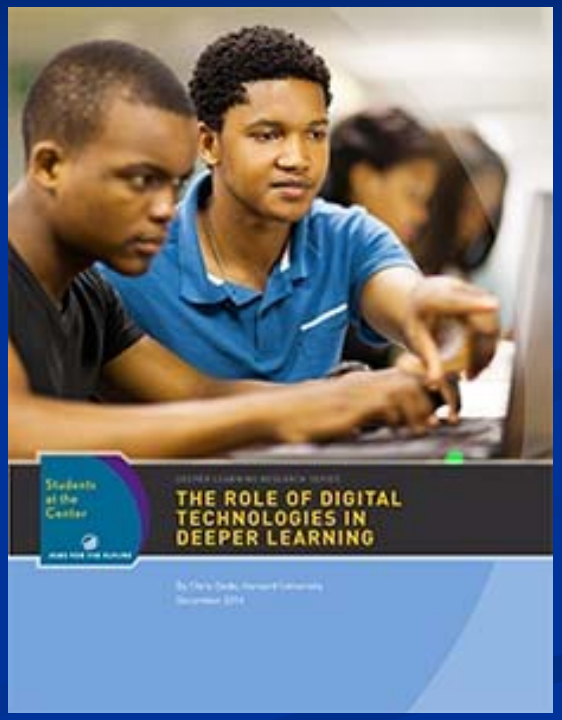
- **Engagement and Identity**
  Students are motivated to do well, see the relevance of their learning, and increase in self-efficacy
- **Evocation and Transfer**
  Immersive interfaces can evoke a wide spectrum of authentic performances with embedded support
- **Evidence for Improvement and Assessment**
  Log files, chat logs, shared notebooks, and similar artifacts provide a rich evidentiary trail

"Deeper Learning"

- Case-based learning
- Apprenticeships
- Self-directed, life-wide learning
- Learning for transfer
- Interdisciplinary studies
- Collaborative learning
- Diagnostic assessments

Dede "Deeper Learning" (2014)

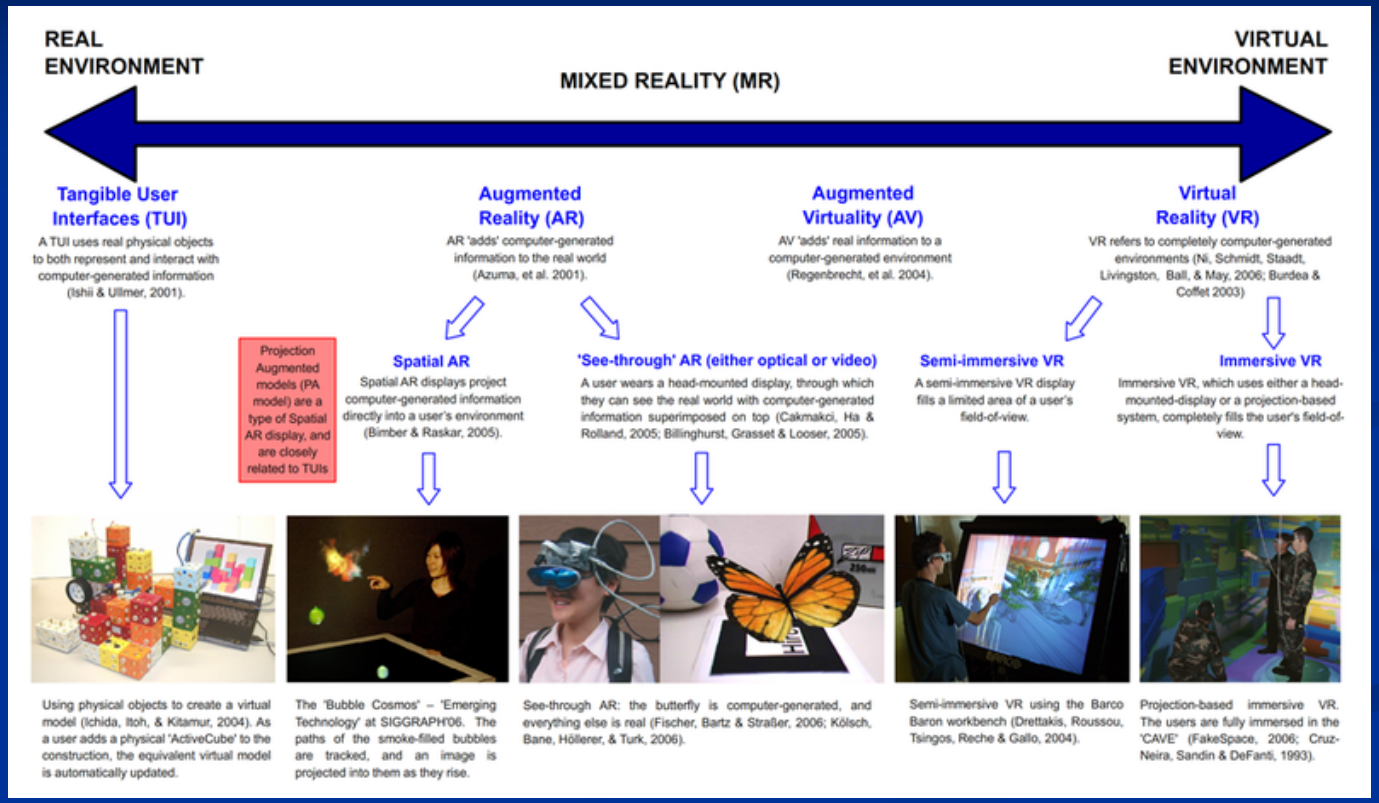
Deeper learning is an instructional strategy that can help students master skills for success in the 21st century. Technology is a powerful way of implementing effective deeper learning



Next Generation Interfaces for "Immersive Learning"

- **Virtual Reality**
  Full sensory immersion via head-mounted displays or CAVEs
- **Multi-User Virtual Environments**
  Immersion in virtual contexts with digital artifacts and avatar-based identities
- **Mixed Reality**
  Combining real and virtual settings in various ways to blend physical and digital phenomena. One flavor is "augmented reality"

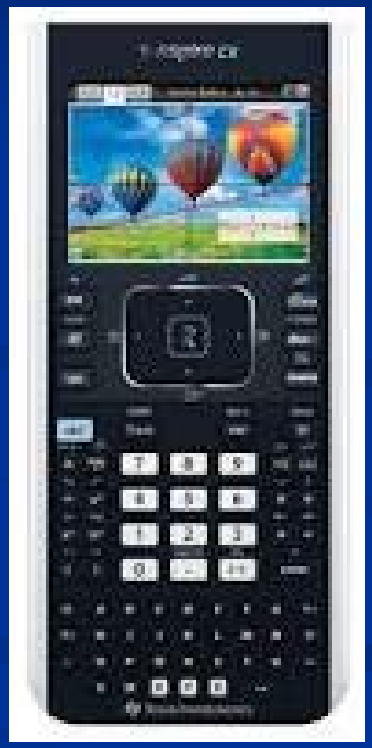
Continuum of *Immersive* Media



Case Study: EcoMobile

1976

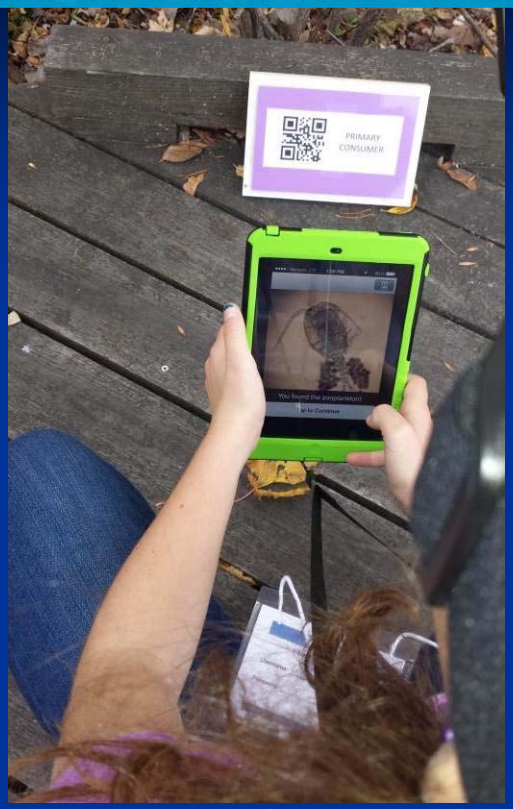
2017



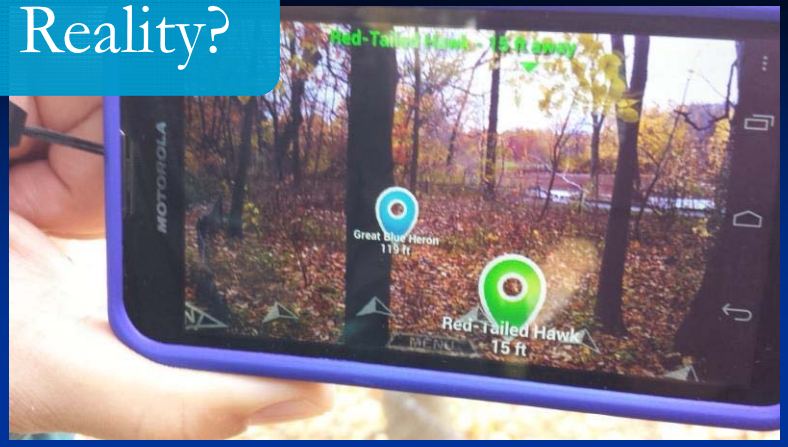
Augmenting Real World Ecosystems

http://ecomobile.gse.harvard.edu

What is Augmented Reality?

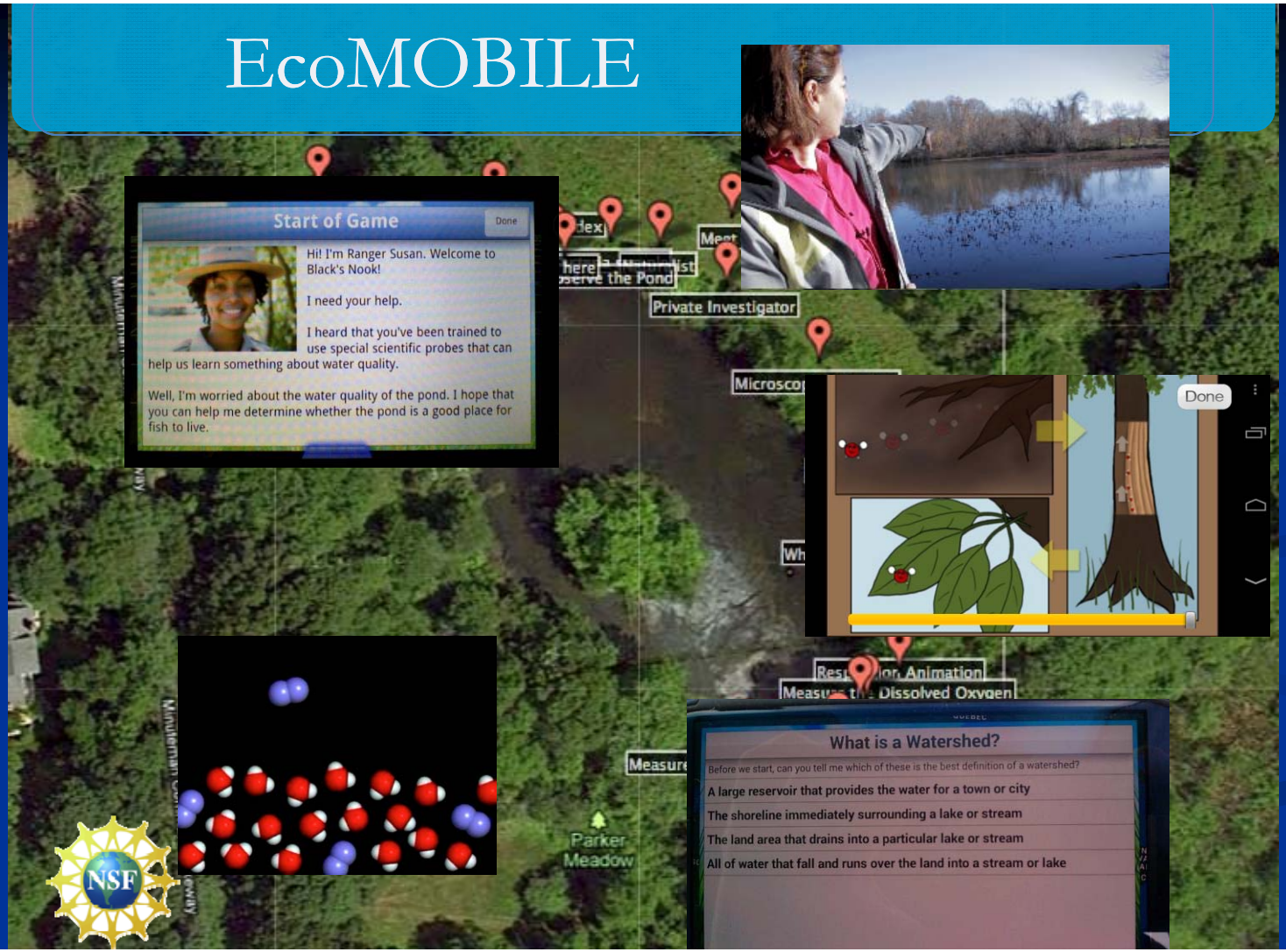


QR code-based Triggers

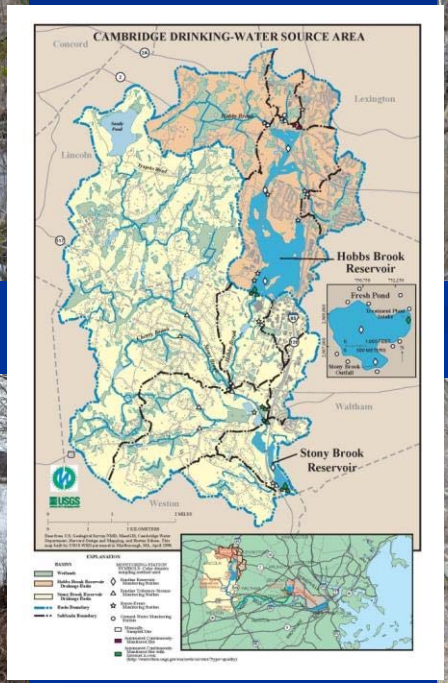


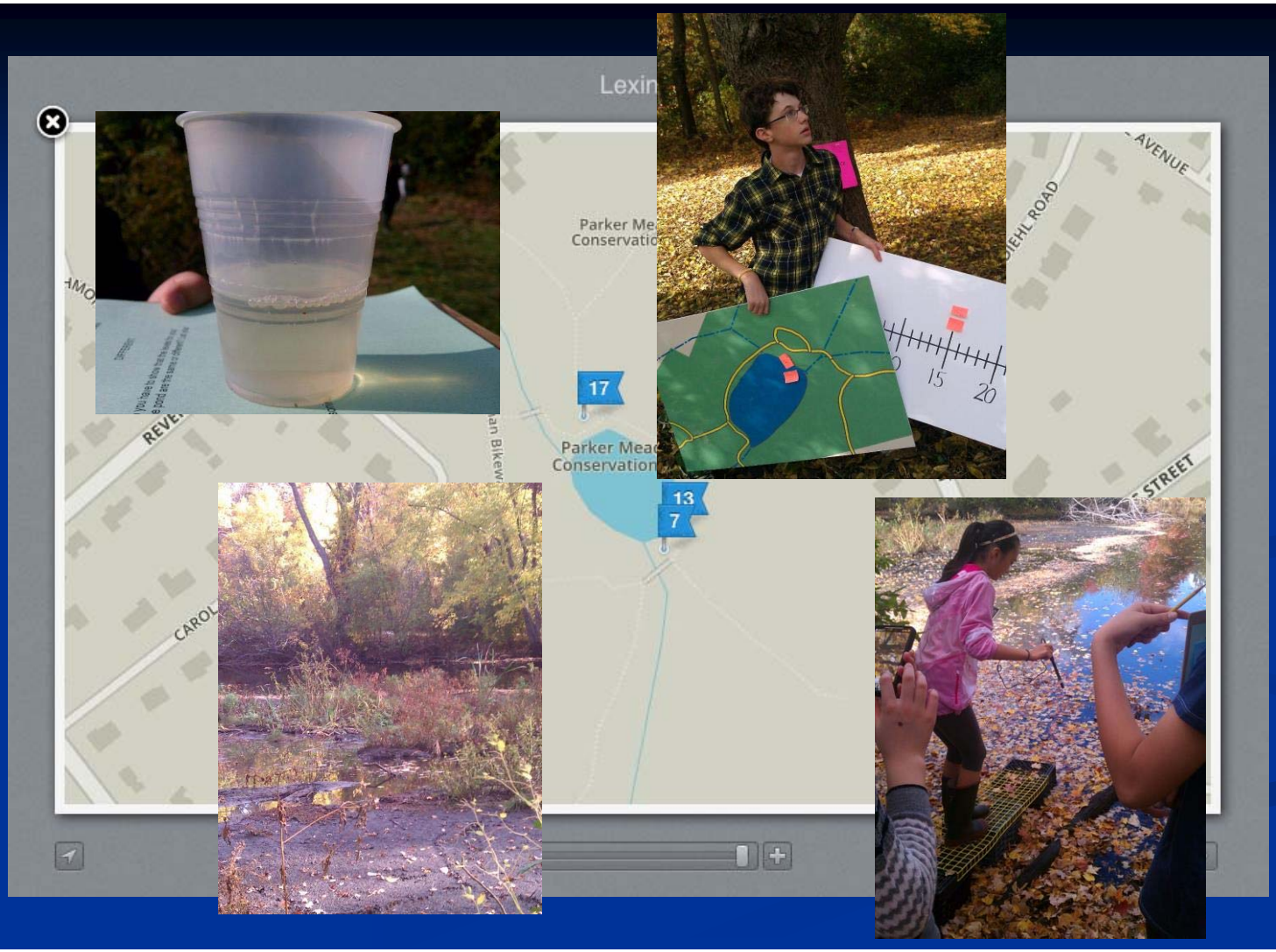
Location-based Triggers

EcoMOBILE


Start of Game
Done
Hi! I'm Ranger Susan. Welcome to Black's Nook!
I need your help.
I heard that you've been trained to use special scientific probes that can help us learn something about water quality.
Well, I'm worried about the water quality of the pond. I hope that you can help me determine whether the pond is a good place for fish to live.
Private Investigator
Done
Dissolved Oxygen
What is a Watershed?
Before we start, can you tell me which of these is the best definition of a watershed?
A large reservoir that provides the water for a town or city
The shoreline immediately surrounding a lake or stream
The land area that drains into a particular lake or stream
All of water that fall and runs over the land into a stream or lake
Parker Meadow

Virtual Binoculars

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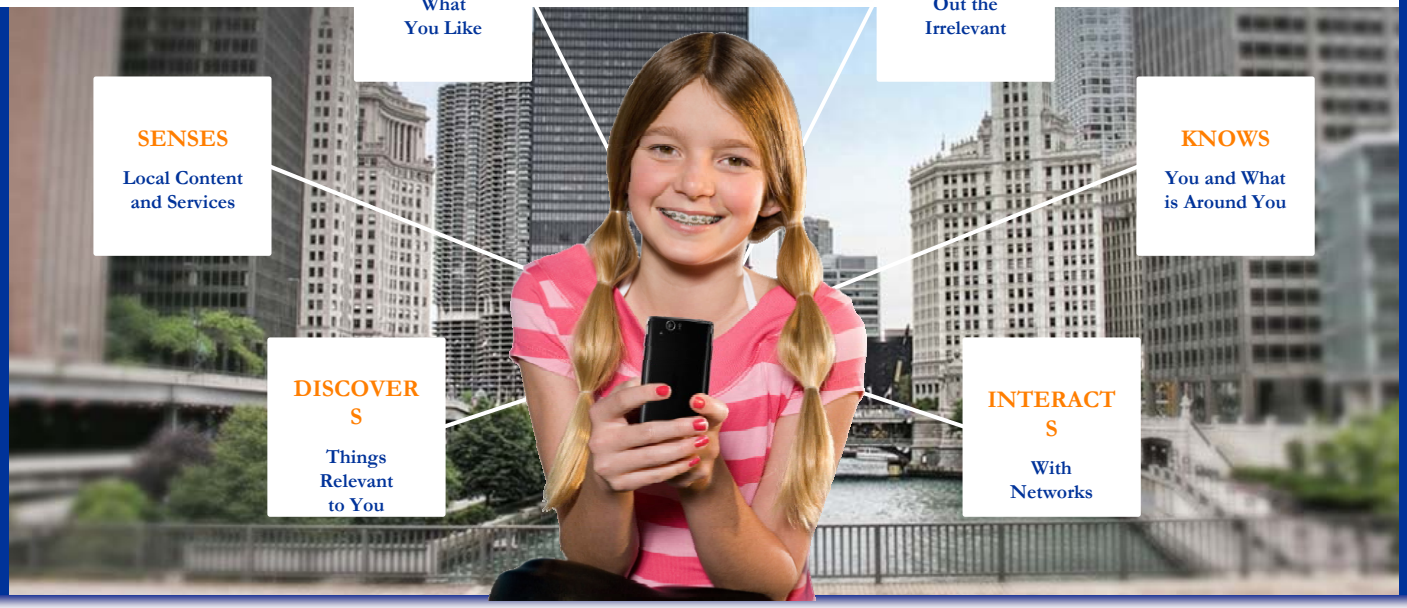
GoPro Cameras Capture EcoMOBILE Experience



Interface for Your Digital Life

IN THE FUTURE YOUR MOBILE PHONE WILL ACT AS YOUR DIGITAL "6TH SENSE"

Case Study: School in the Park

Case Study: School in the Park

3rd, 4th and 5th graders from San Diego schools attend "school" 5-8 weeks a year, learning at 10 cultural institutions at Balboa Park

Case Study: School in the Park

Students used a smartphone and augmented reality environments to augment, extend and enhance learning at the San Diego Zoo, San Diego History Center, and Museum of Art

Case Study: School in the Park

Project goals:

1. Provide meaningful way for students to develop inquiry skills as well as content knowledge

2. Help students develop technical skills using advanced tools that may not be available to them at home or in school

3. Take advantage of the unique assets of the Balboa Park institutions and to introduce the students to these resources in their backyard

4. Engage students in learning that creates opportunities for extended self-directed learning

Case Study: School in the Park

Case Study: School in the Park

Outcomes:

- Development of 40 unique AR experiences that amplified the resources and assets of the museums and zoo for learning purposes
- Increased content knowledge with especially strong gains for English language learners and students needing non-traditional learning experiences
- Provided a concrete way to embed critical thinking skill development within curriculum
- Helped to shift teacher mindset to understand value of student-focused, student self-directed learning experiences

Case Study: School in the Park

Outcomes:

"In the past, the teachers and museum educators took pictures of the students' portfolios, printed out the pictures and assembled them for the students to bring home. This was heavily teacher-focused. Now, students are taking pictures on their devices, putting them into a digital slideshow, posting them on blogger, and having conversations about them online in one-third of the time the previous method took. This way is more student-oriented, where students, instead of their instructors are the digital content producers."

SITP Teacher

Case Study: School in the Park

Lessons learned:

- ✓ Look around you! Partnerships and assets that can be leveraged with AR are all around you.
- ✓ Development of effective partnerships require skill, attention, extra communications and nurturing. Be patient with your partners!
- ✓ Think about the devices that will be used – are they appropriate for the planned usage?
- ✓ Evaluate impact from multiple perspectives – be open to surprises

Case Study:
STEAMing Ahead with Mobile Learning

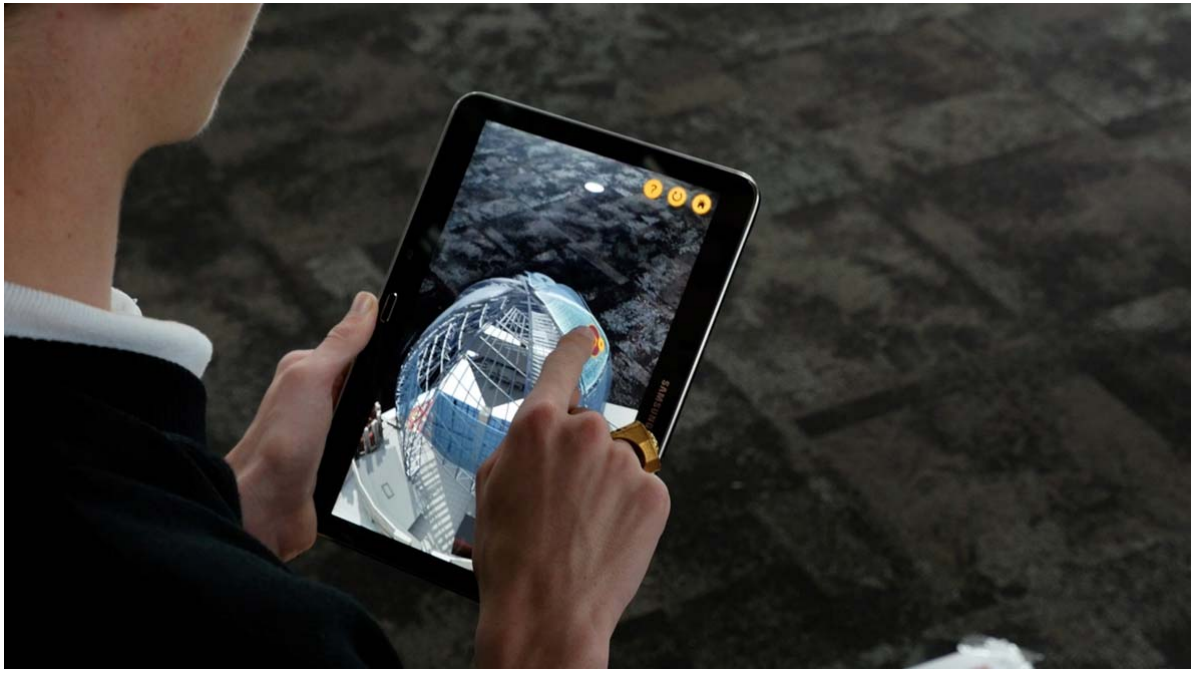
Case Study: STEAMing Ahead with Mobile Learning

e3 CIVIC HIGH
engage • educate • empower

SAN DIEGO PUBLIC LIBRARY
DISCOVER YOUR NEXT CHAPTER

Innovative program taking advantage of a unique environment: a charter high school that is resident within the public library in San Diego

Case Study: STEAMing Ahead with Mobile Learning



9th graders use a 4GL tablet with an AR app to learn about STEAM elements within the Central Library Dome design, engineering and construction

Case Study: STEAMing Ahead with Mobile Learning

Project goals:

1. Provide a contextually relevant learning experience for students that can introduce students to the role of STEAM within construction and design

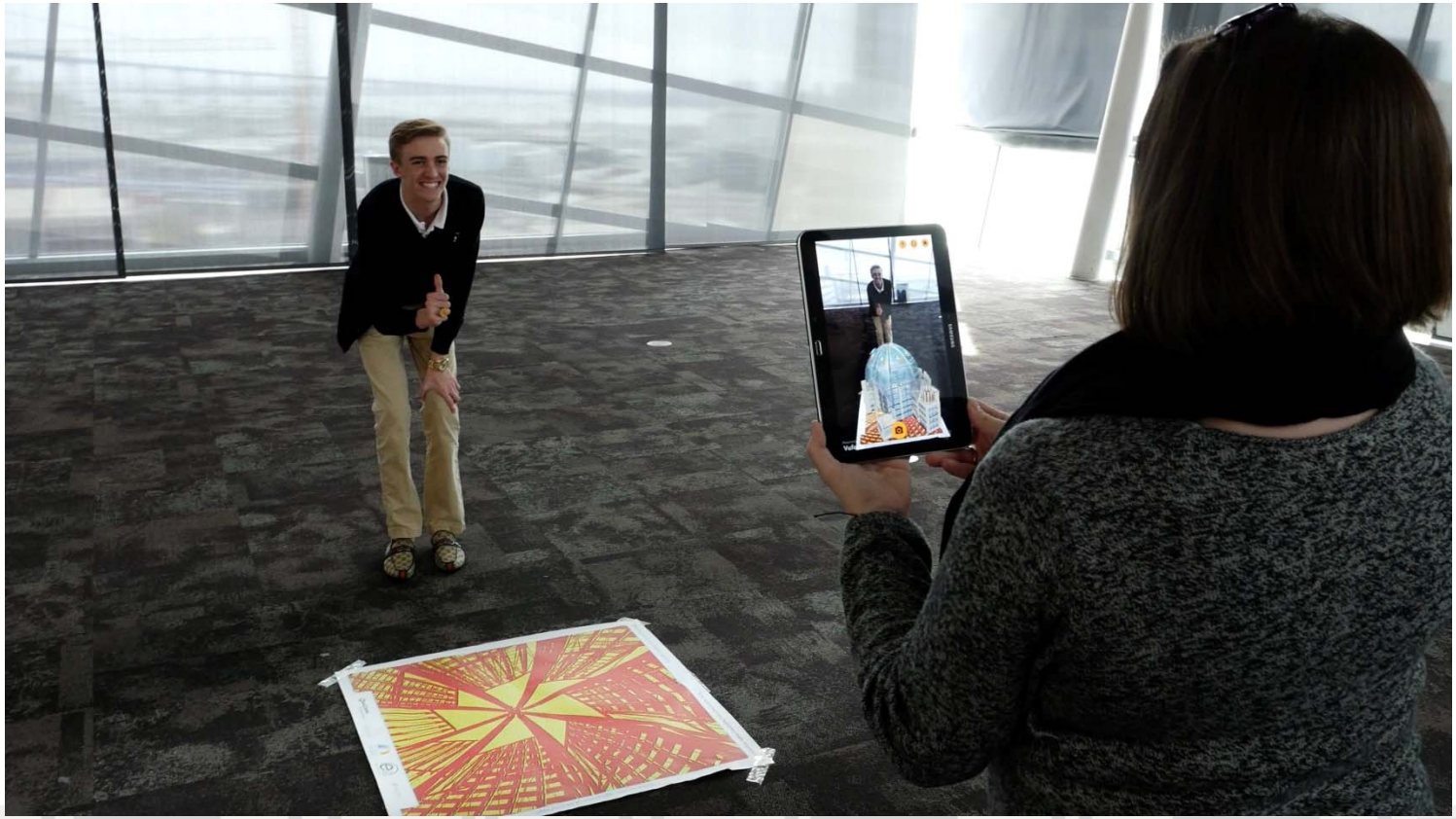
2. Leverage emerging technologies to increase student engagement in learning and in their unique school environment

3. Increase student interest in STEAM career fields

4. Pilot use of AR with students to test applicability within other curricular fields and with the general public

Case Study: STEAMing Ahead with Mobile Learning

Case Study: STEAMing Ahead with Mobile Learning



Case Study: STEAMing Ahead with Mobile Learning

Outcomes:

- Students said use of AR content increased their engagement in learning
- Benefits included having opportunity to work collaboratively with classmates on a real world activity; enjoyment level surprised the students!
- Different learning modalities within the experience appealed to different students: videos, images, text, assessment
- 40% of the were more interested in a STEAM career field as a result of this learning experience
- Teachers' excited about how to use AR in other curricular areas; library staff exploring ways to bring same content to general public

Case Study: STEAMing Ahead with Mobile Learning

Outcomes:

"This was a great experience. This could be the new way of learning for the next generation of students like me."

"It was a different way of learning. I liked how the Augmented Reality showed how the dome of the library around us is history and we are a part of it."

"The things that I learned about how the dome was built was interesting to me because now I am very interested in engineering."

Collected from 9th grade students at e3 Civic High School

Case Study: STEAMing Ahead with Mobile Learning

Lessons learned:

- ✓ The connection between the AR content and the curriculum is important for teachers to use effectively, and adds relevancy to the learning process.
- ✓ Supporting tools within the app provided a variety of learning modalities that are important for engagement of all students
- ✓ Stability of the Internet connectivity is essential – using the tablet's 4G was better than relying upon school access points
- ✓ Understanding how to interact with AR content is a new workplace skill that students need to learn

Additional resources

Augmented Reality Case Studies: additional resources

Role of Technology in Deeper Learning:
http://www.studentsatthecenter.org/topics/role-digital-technologies-deeper-learning

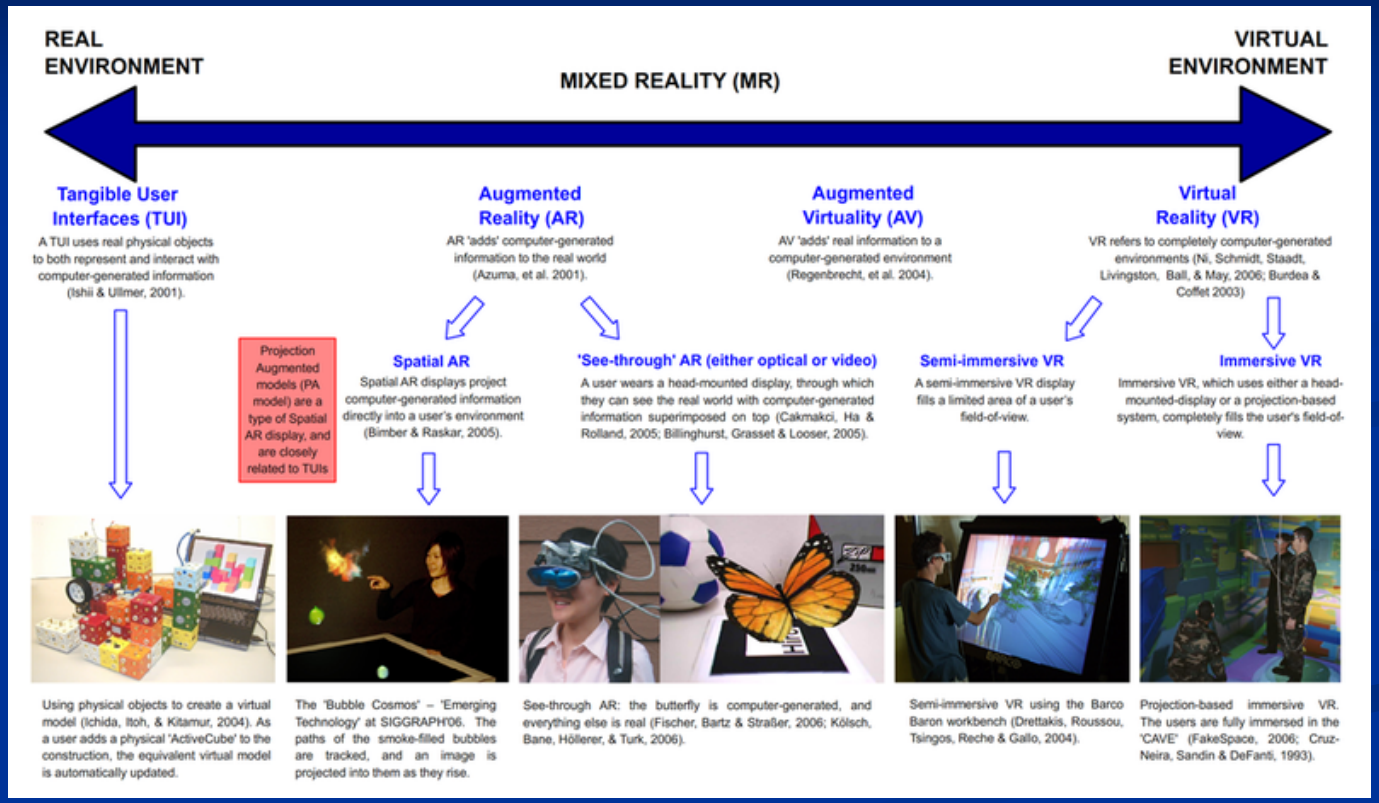
EcoMOBILE Case Study:
http://ecolearn.gse.harvard.edu

School in the Park Case Study:
https://www.qualcomm.com/company/wireless-reach/projects/united-states-augmented-reality

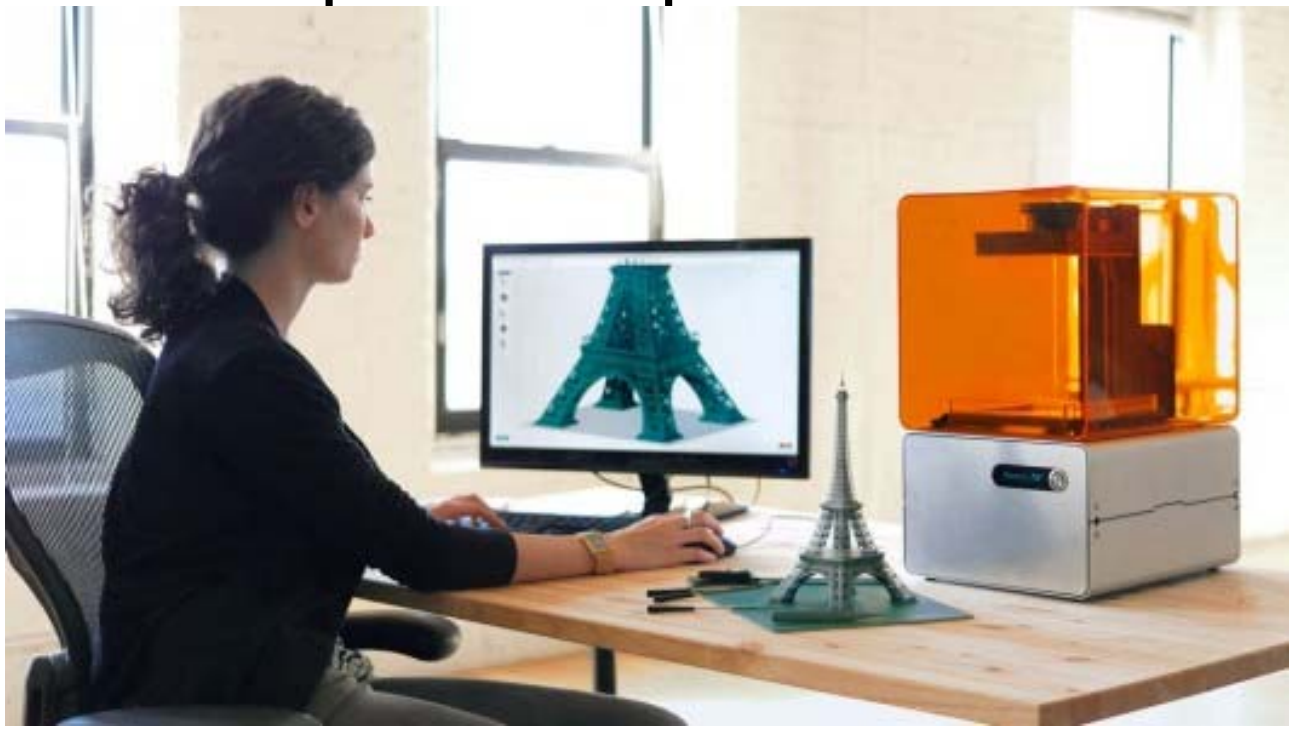
STEAMing Ahead with Mobile Learning Case Study:
To be announced at FETC 2017

A Glimpse into the Future

Continuum of *Immersive* Media



Modern Manufacturing
Helps Us Shape our World



http://formlabs.com/

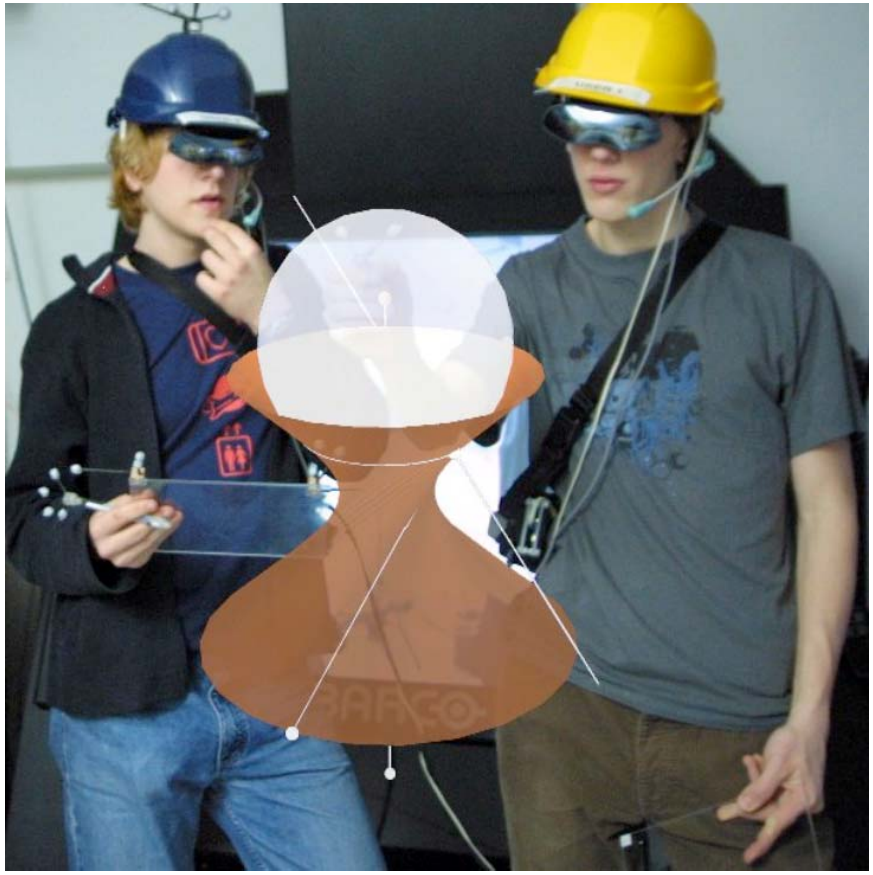
Augmented Reality Lite

Uses both GPS and Compass

Layar Inc.

Google Glass

True Augmented Reality



Kaufmann 2006

Information Revealed

Satisfies the mind's desire for "Closure"

Immersive Theater

http://speakeasydollhouse.com/

Museum Exhibits

Hughes 2004

Manipulating Imaginary Objects

MetaVR

Your Turn:
your questions, comments, ideas

Thank you for joining us today.

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