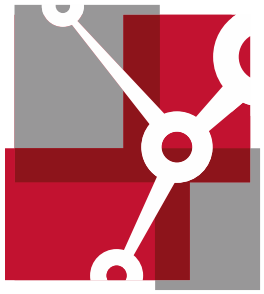


Carnegie Mellon University
Entertainment Technology Center

Bringing Biome Exploration into the Classroom through Interactive Tablet Experiences

Mike Christel, Jessica Trybus, Siddhant D. Shah, Bo Hsuan Chang, Roma Dave, Adarshkumar Pavani, Ojas D. Sawant, Jimin Song, James Inglis, Sai Shashank Kairamkonda, Christian Karrs, Xuyan Ke, Eric Kron, Xinghu Lu

christel@cmu.edu

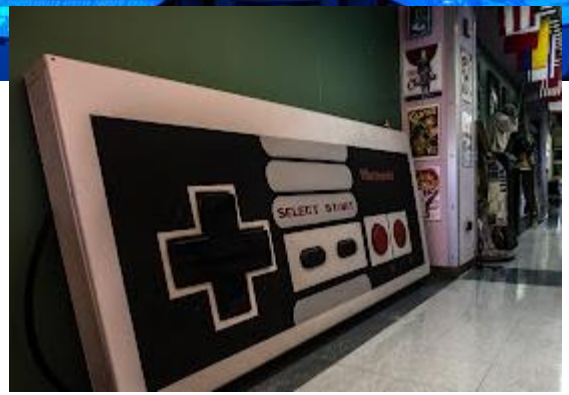
LEARN
WORK
PLAY

Talk Outline

- Entertainment Technology Center projects
- Games to bring biomes into the classroom for children ages 8-11
  - *Hello Ocean* (Imagica)
  - *Arctic Stars: The Far North* (Xuyan Ke)
- Iterative playtesting/development cycles
- Pointers for further information

ETC: Art + Technology

- 2-year professional graduate degree: Master of Entertainment Technology
- Students work on semester-long projects



Bring Biomes into Classrooms

- Sponsored by Benedum Foundation
- Can West Virginia students experience more of the world in their classrooms through tablets?

ETC Imagica: Caribbean Reef

Imagica: 15 weeks, 6 Students

Producer, UX designer, 2D/3D artist, animator, interaction & tech programmer

Iterative Playtesting with Imagica

- Tablet-driven experience for 8-11 year olds
- Marine biologist validates content
- Child-testing confirms appeal of experience

Y.E.T.I.: 15 weeks, 6 Students

Producer, designer, programmers, rigger and animator, 3D and environmental artist

Iterative Playtesting with Y.E.T.I.

- An educational game that takes players into the Arctic tundra, introduces them to its life forms, and gives them a feeling of discovery
- Tundra wildlife expert validates content
- Child-testing confirms appeal of experience

Biomes for Learning

- High visual fidelity
- High navigational freedom
- See paper and reference to Maria Harrington's work, The Virtual Trillium Trail and the Empirical Effects of Freedom and Fidelity on Discovery-Based Learning, *Virtual Reality* **16**, 2, 105-120 (2012)

Design Constraints

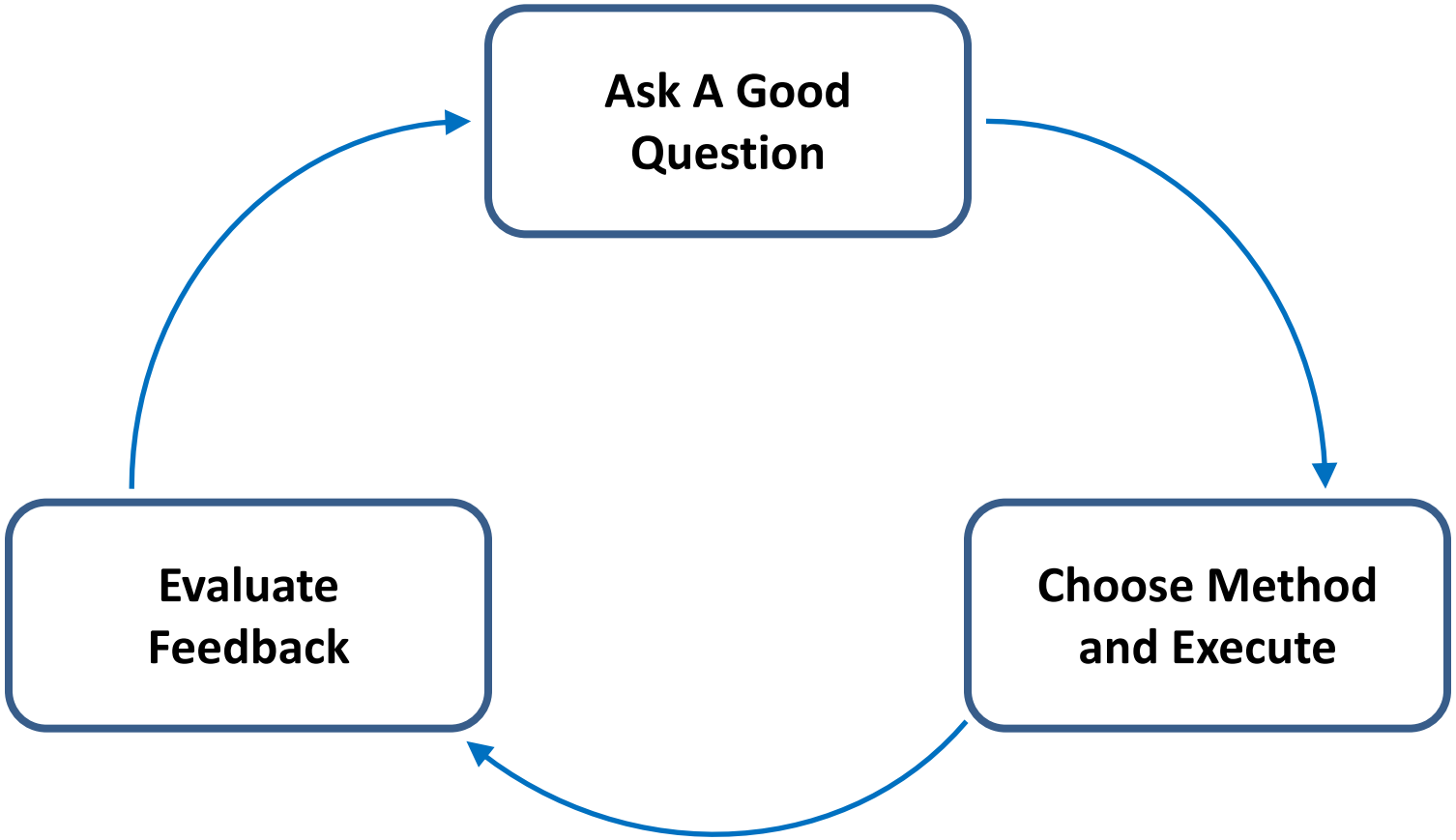
- Open children's awareness to other nature biomes
- Be very easy to use
- Offer the opportunity to explore a (visually) rich environment
- Be simple and complete (not vertical slice)
- The experience should start a conversation. It does not need to provide the lesson: teachers can use it as motivation….

Learning Feedback Loop

(Butler, 1997; Pintrich, 2000; Winne & Hadwin, 1998)

Pintrich, P. R. (2000). The role of goal orientation in self-regulated learning. In M. Boekaerts, P. R. Pintrich, & M. Zeidner (Eds.), Handbook of self-regulation (pp. 451-502). San Diego: Academic Press.

Playtest Refinement Loop



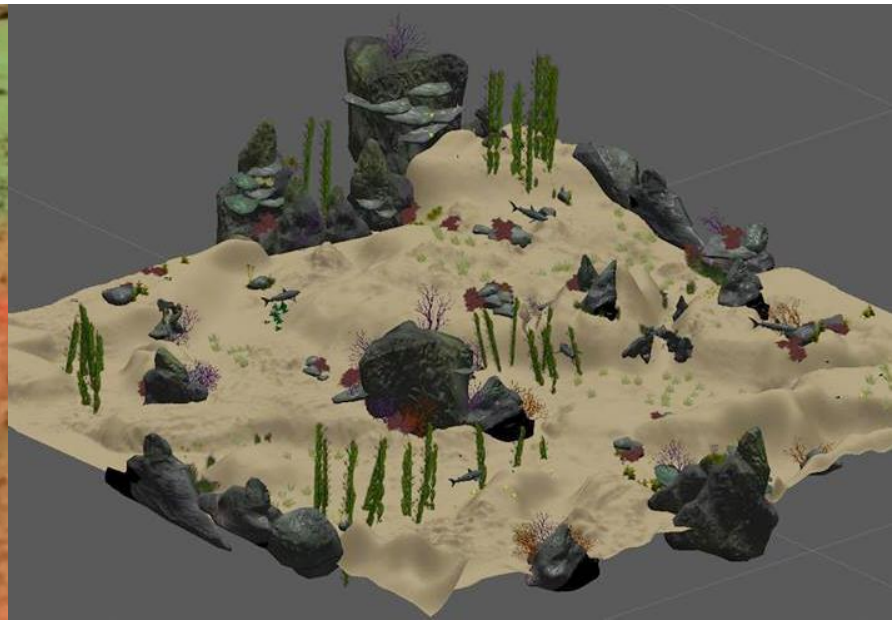
Imagica Building Blocks - 1

Design research with marine biologist

Carnegie Mellon University
Entertainment Technology Center

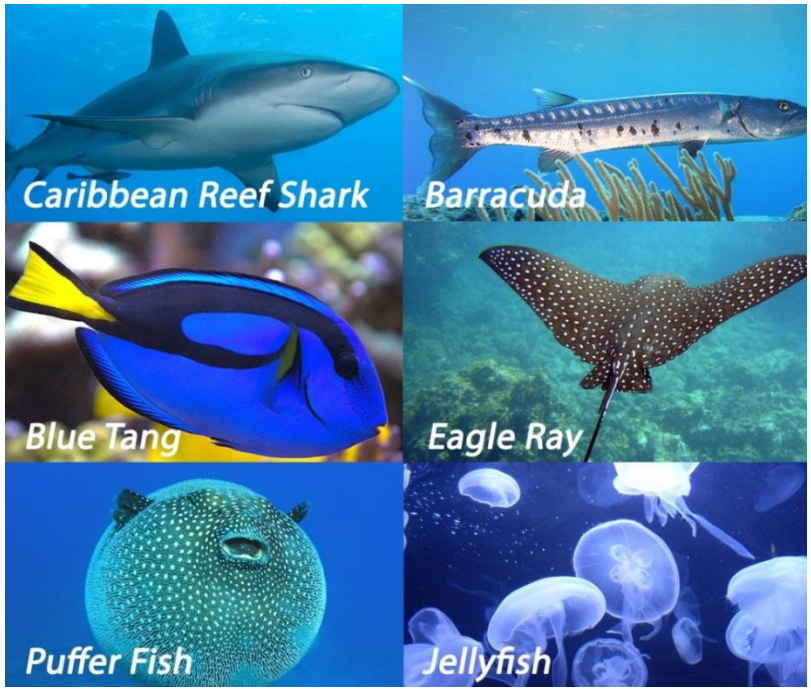
Imagica Building Blocks - 2

Terrain building



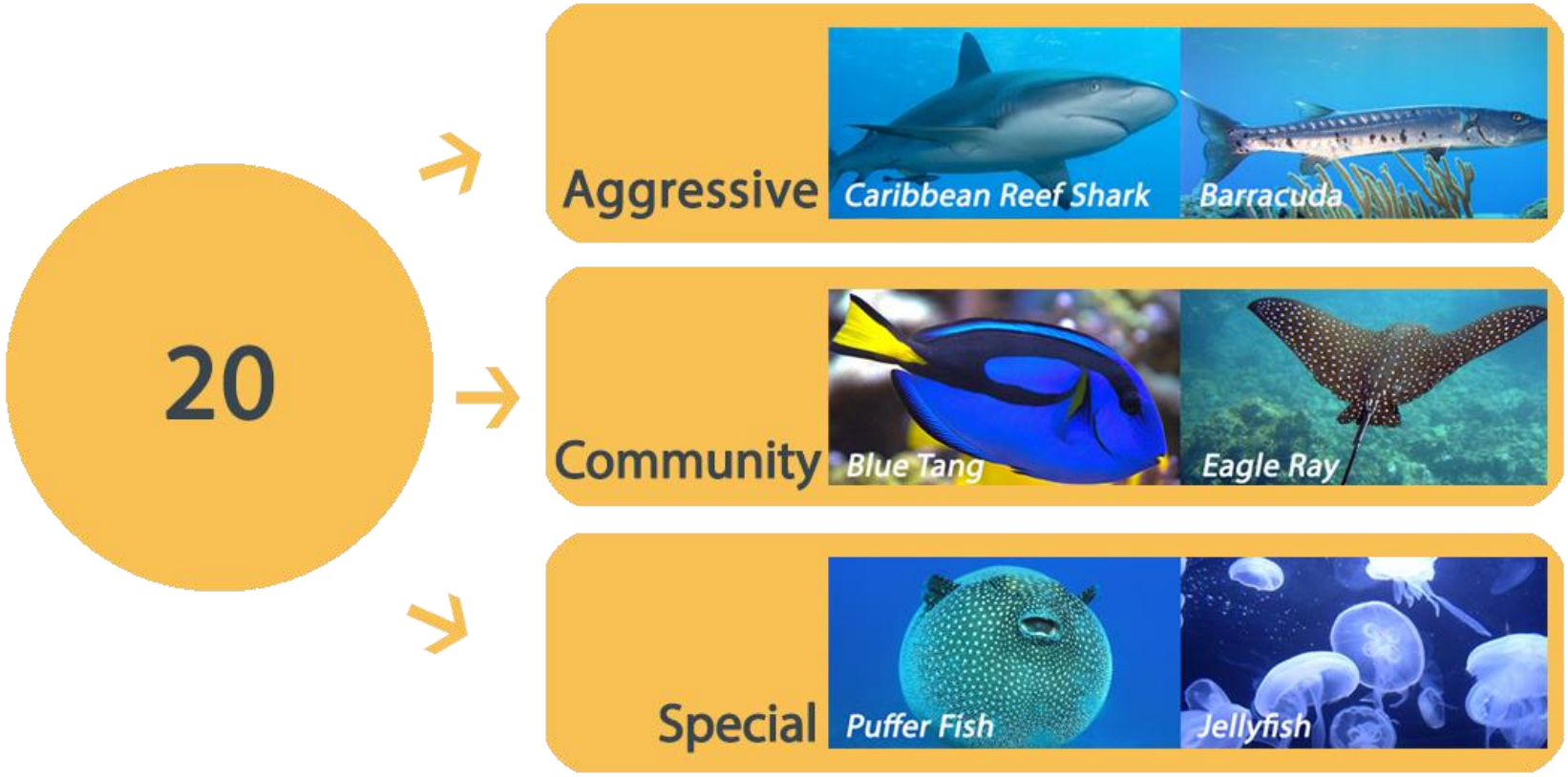
Imagica Building Blocks - 3

Asset creation: Ocean environment and fish



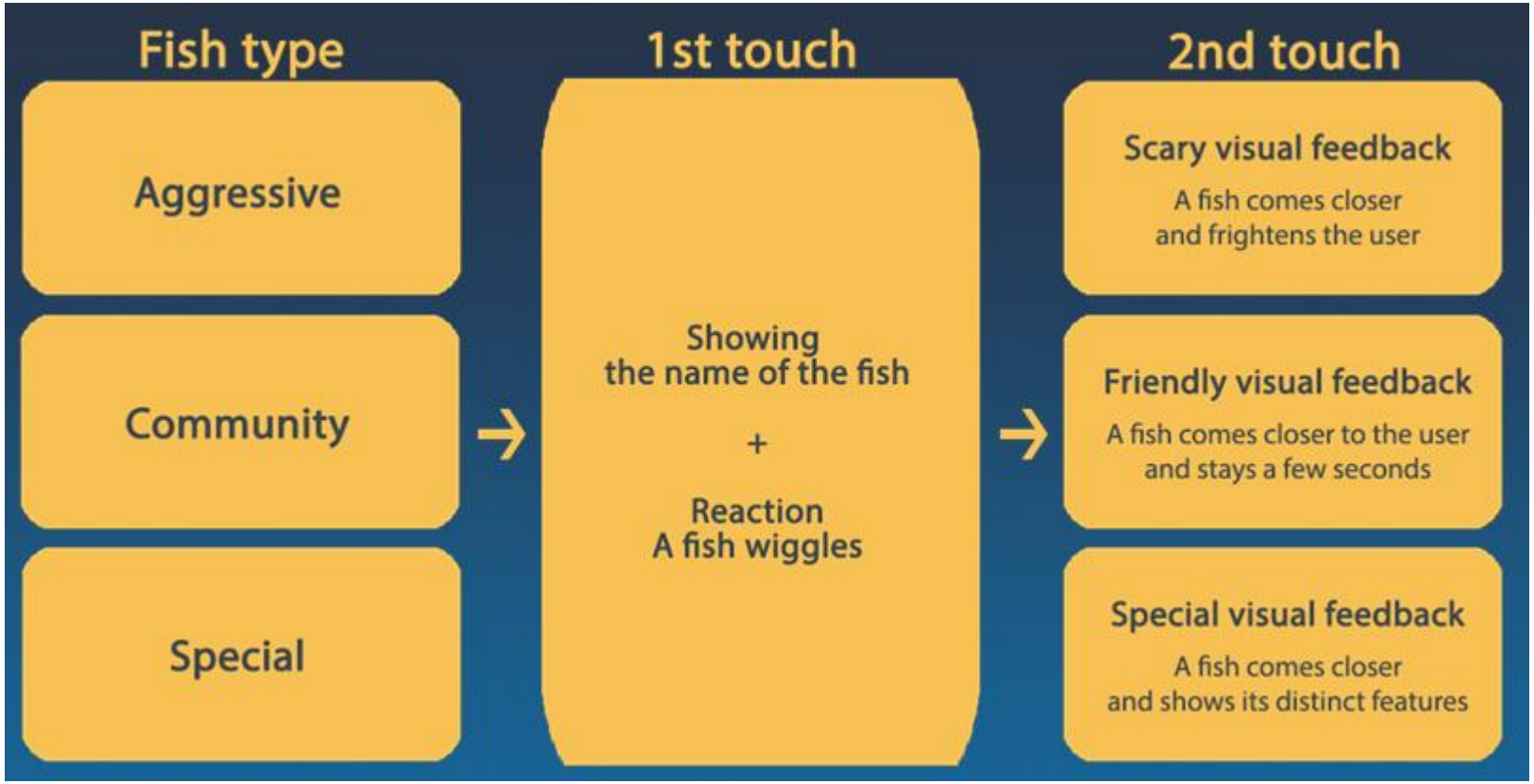
Imagica Building Blocks - 4

Designing interactions for player



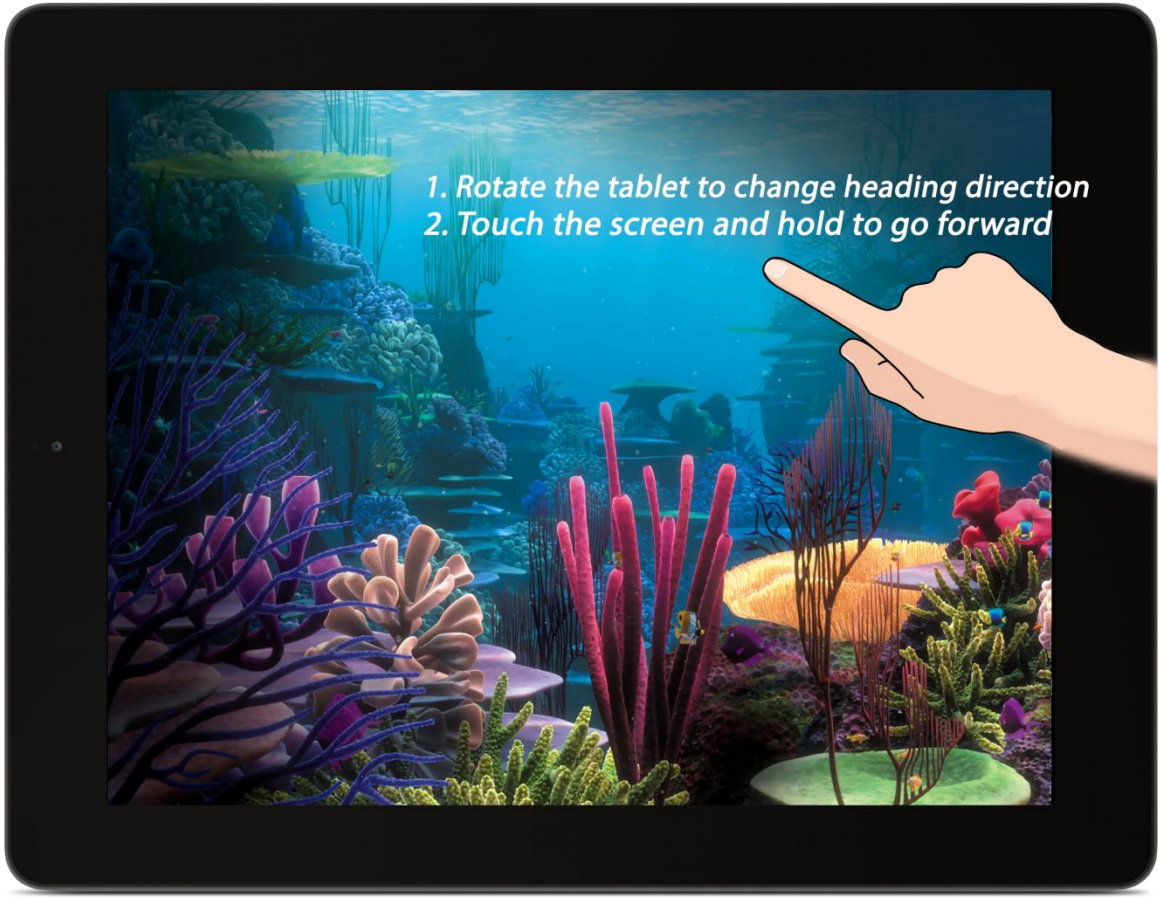
Imagica Building Blocks - 5

(Note: First iteration had 1st, 2nd, 3rd touch interactions)



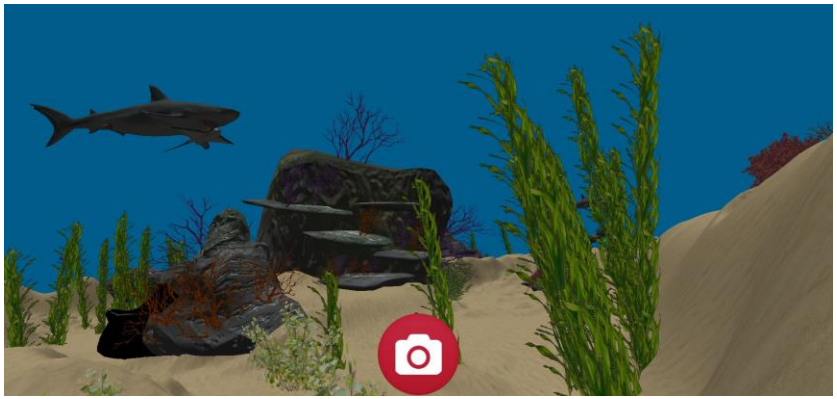
Imagica Building Blocks - 6

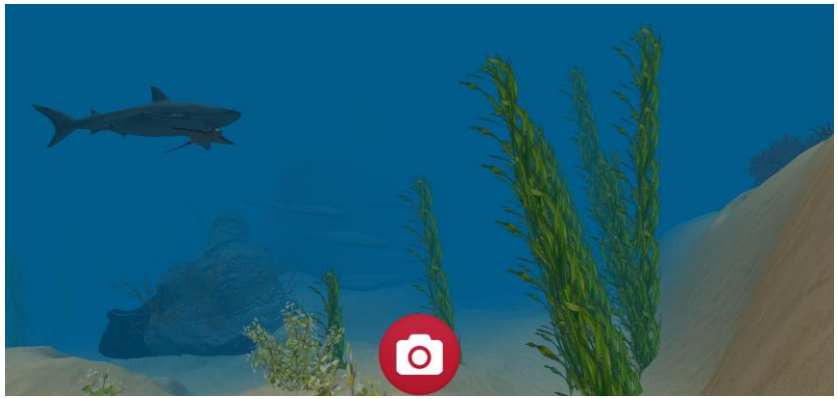
Interactive experience about exploring underwater biome

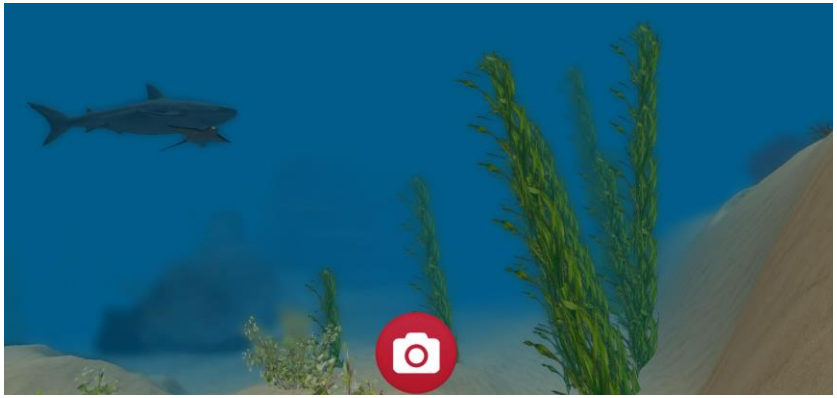


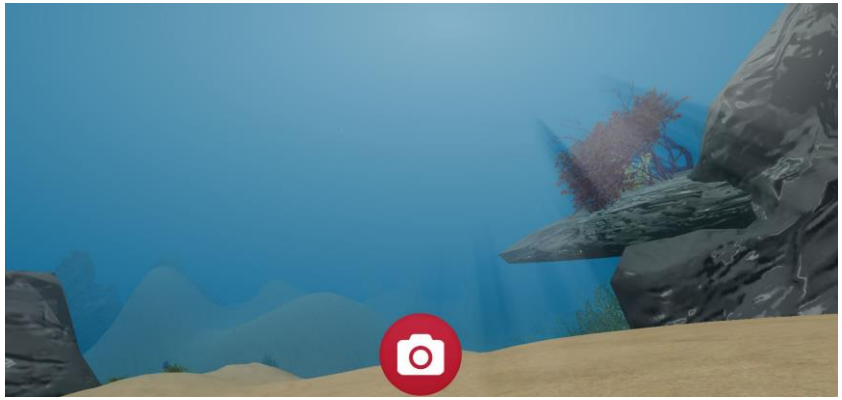
Imagica Building Blocks - 7

Visual Enhancements (fog, shaders, “God rays”)

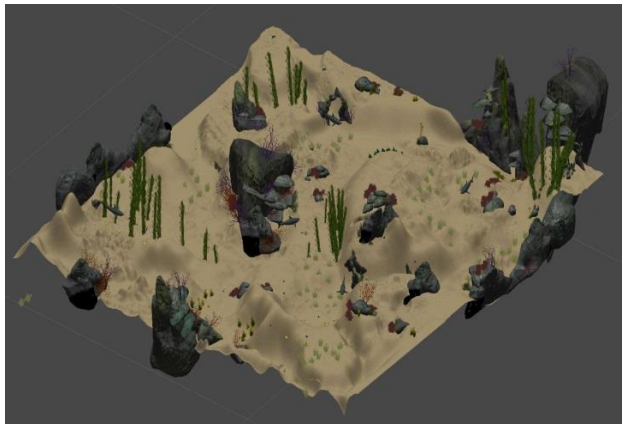




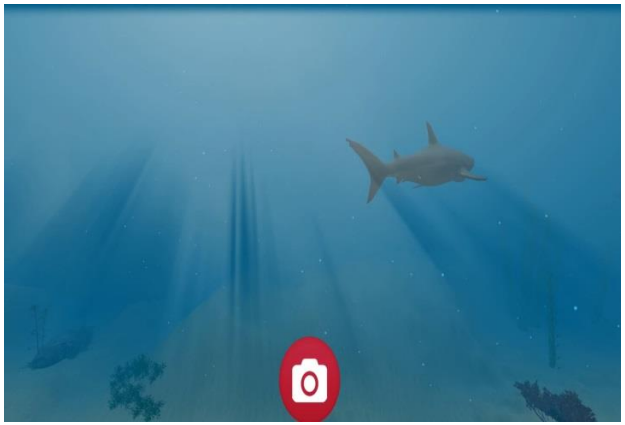




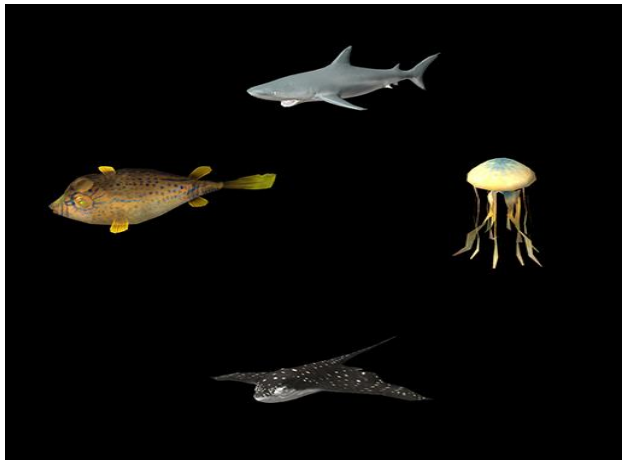
Imagica: Pieces for Playtest



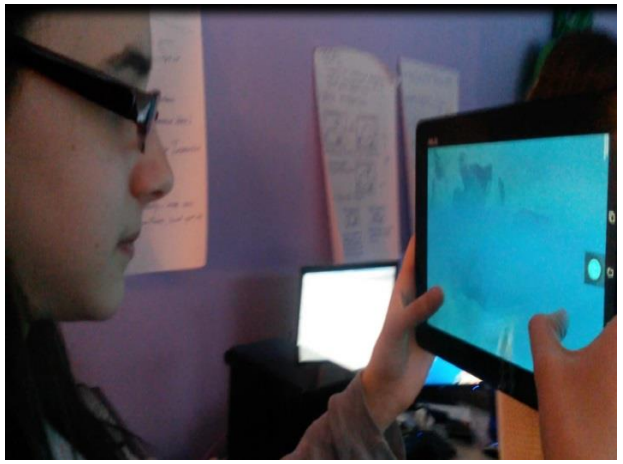
Terrain



Water Environment



Art Assets



Touch Interactions

Imagica Early Prototyping

K-1st Grade (ages 5-7)

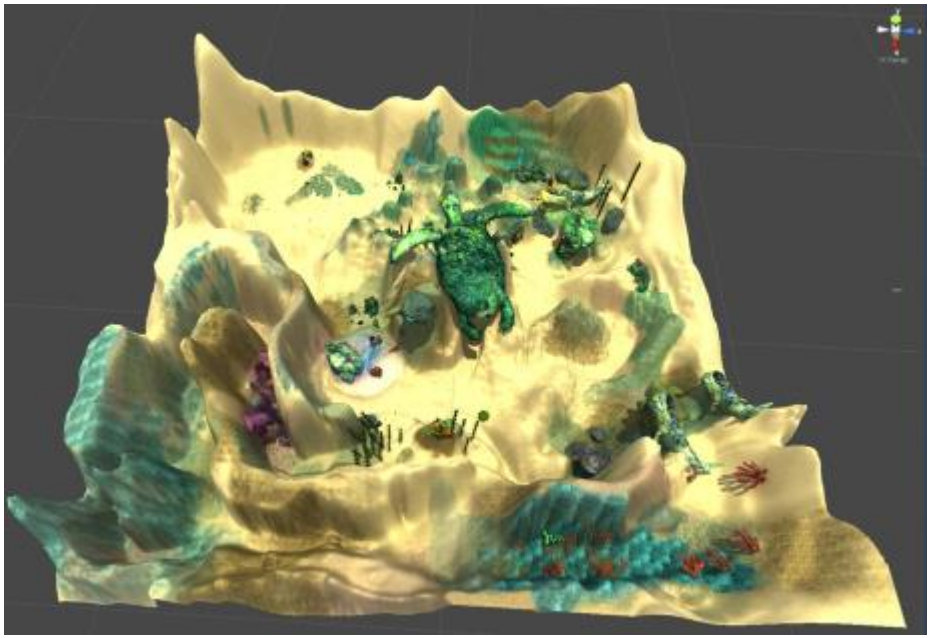
- Difficult to hold tablets
- Became tired
- Preferred sitting
- Confused by untraditional navigation

2nd – 5th Grade (ages 8-11)

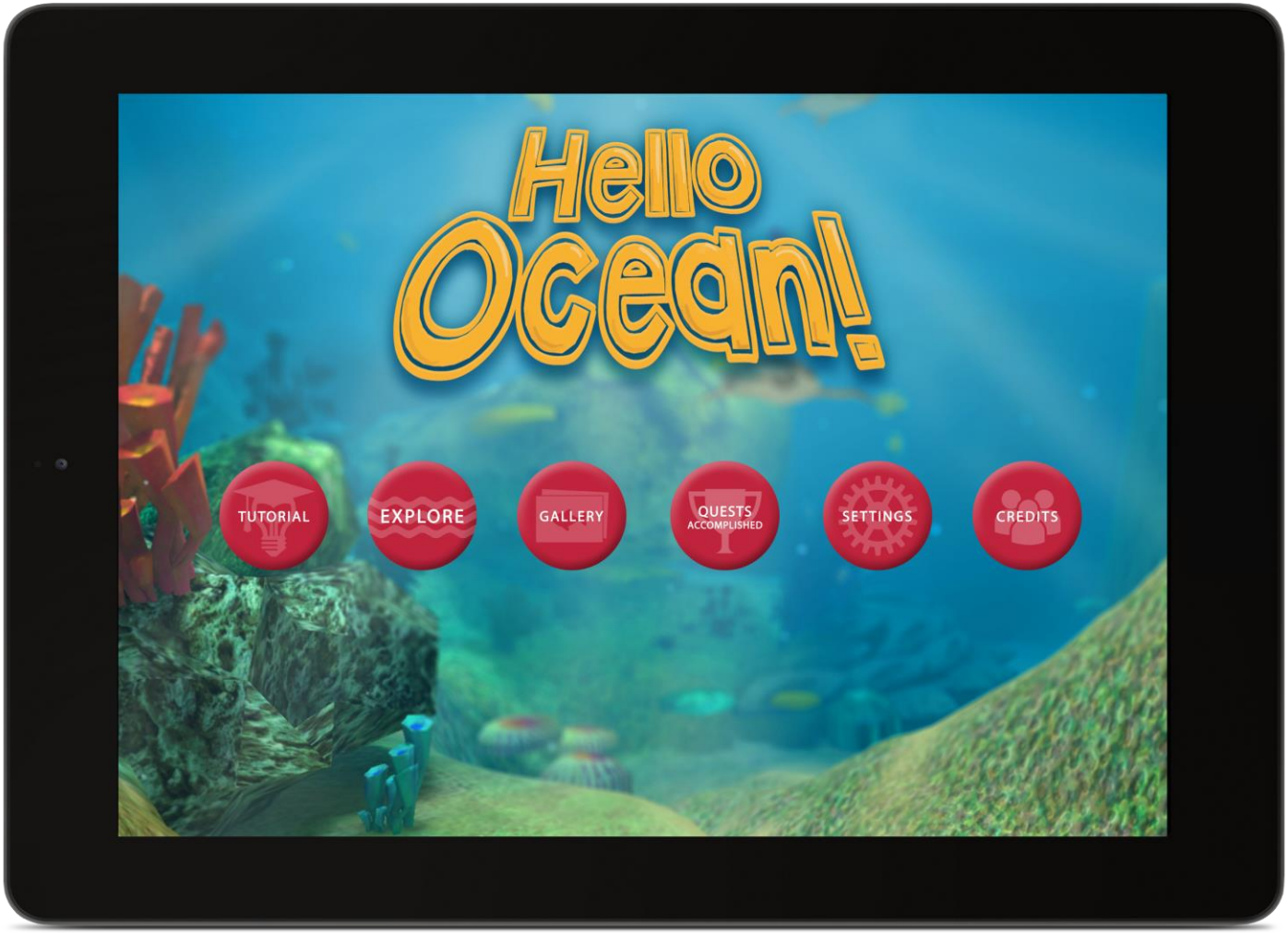
- Enjoyed tablet experience
- Easily interacted with fish
- Excited to take pictures
- Wanted more fish

More Imagica Playtest Iterations

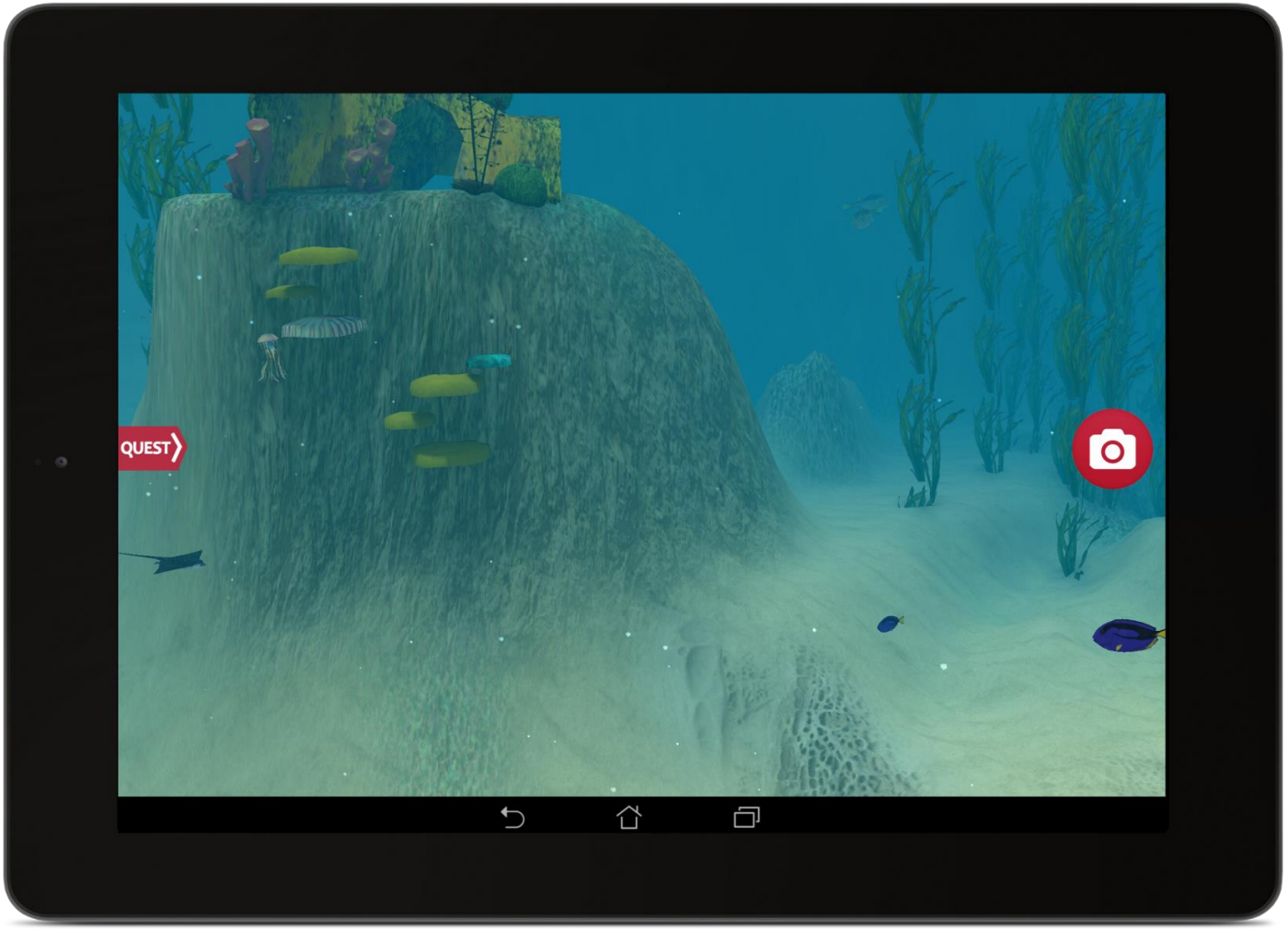
- Modified 3-touch mechanism to 2-touch (juiciness, surprise)
- Emphasized player discovery: revised terrain
- Teacher resources



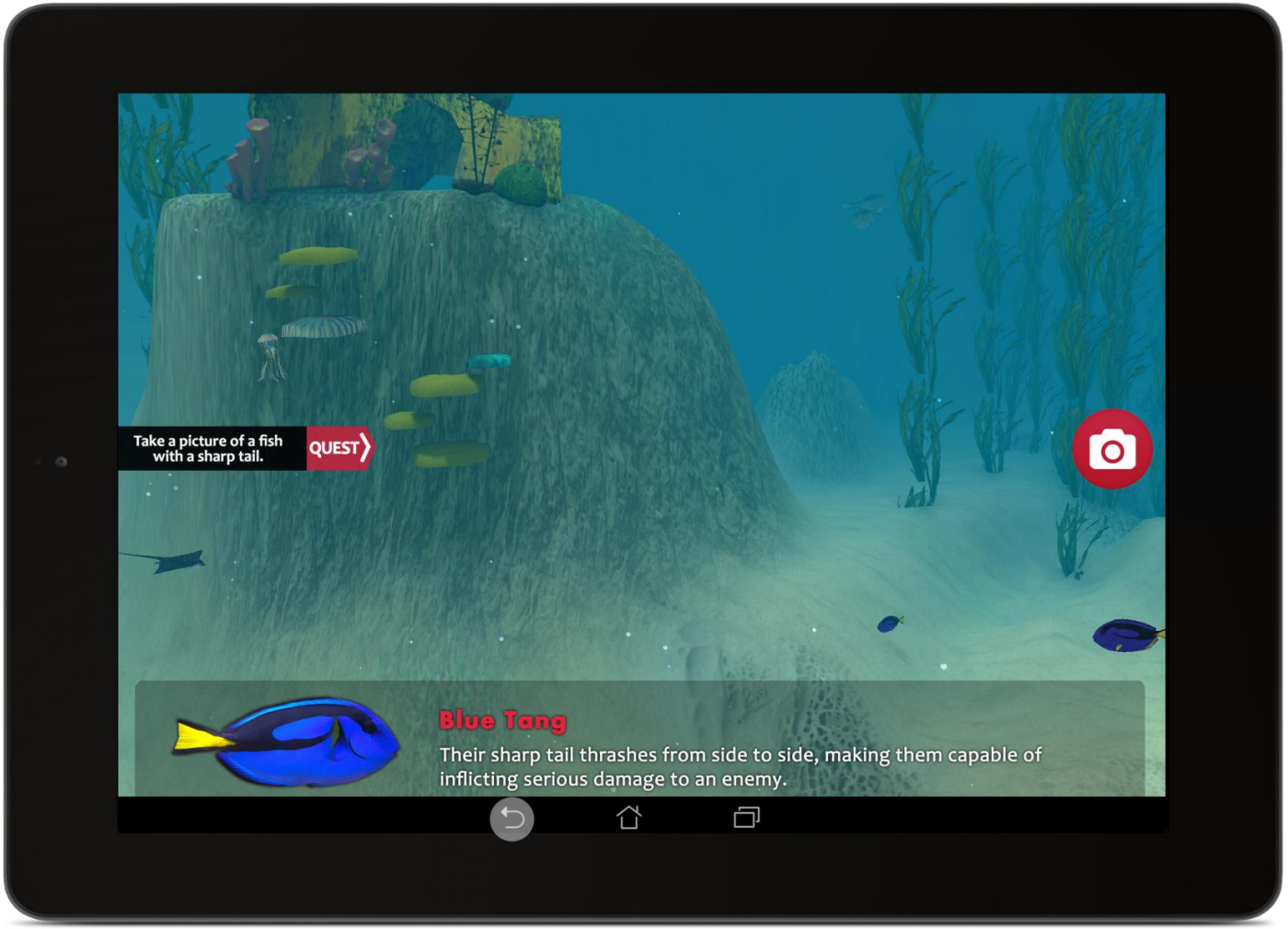
Imagica UI: Menu



Imagica UI: Explore



Imagica UI: Explore Quest



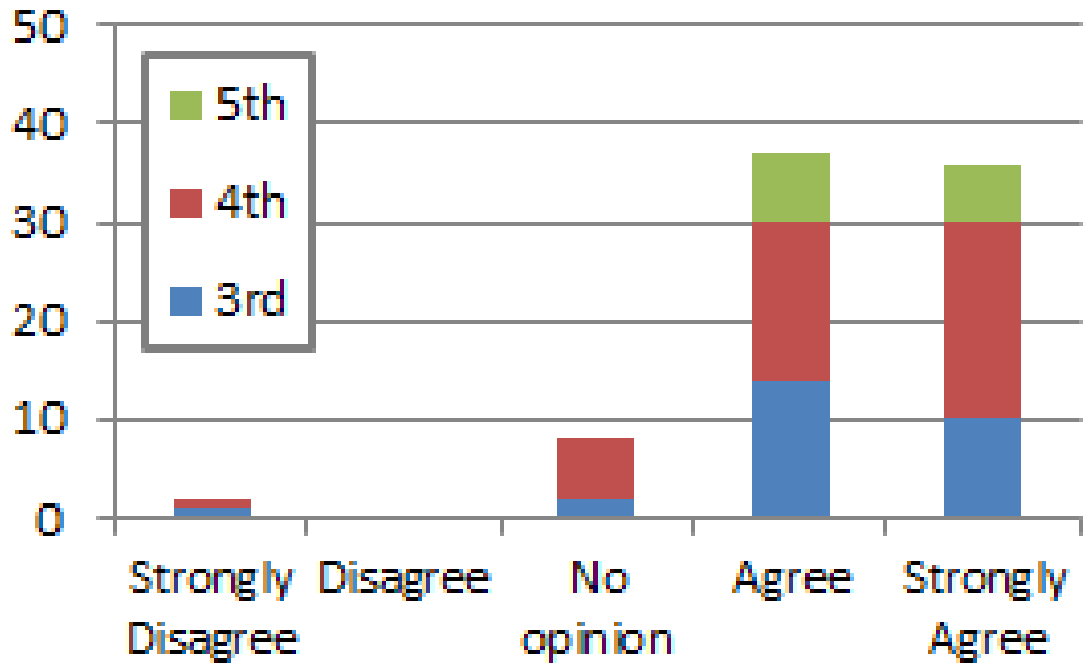
Imagica: Redesigned Quests

- Quests initially shifted focus away from exploration
- Revised quests:
  - Can be turned on or off
  - Quests don’t start immediately (explore first)
  - Quests can be abandoned
  - Quests can be shown again
  - Quests tied to sea creatures and fun facts

Imagica: Child Reactions

83 playtesters in grades 3-5 (ages 8-11)

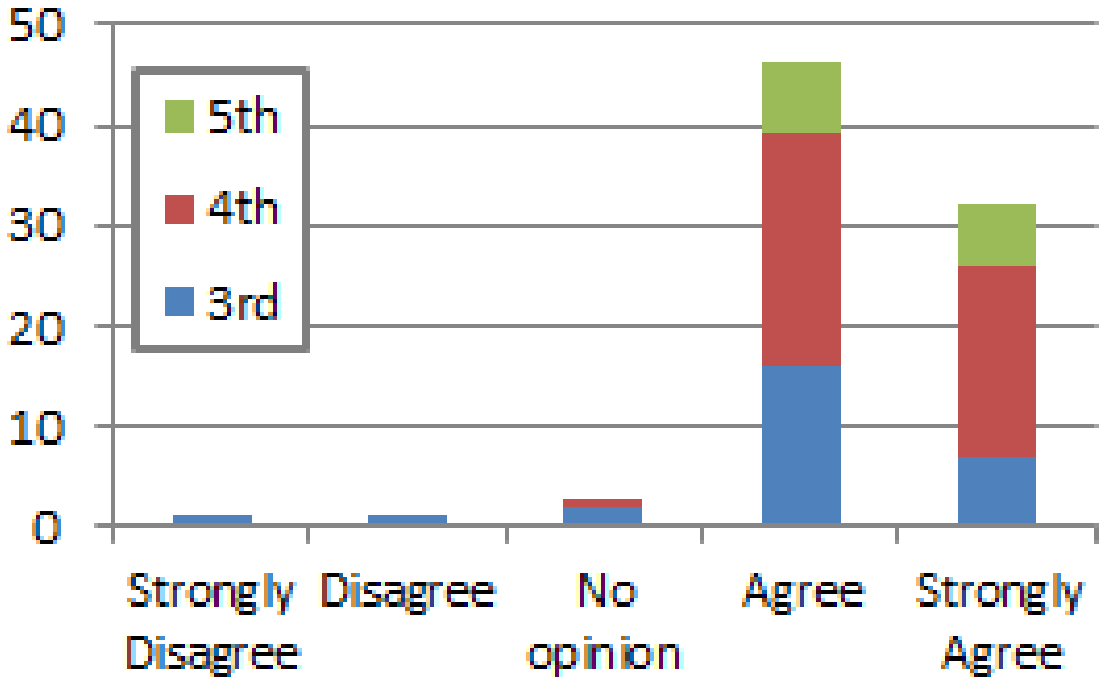
Response to “I know more about the ocean.”



Imagica: Child Reactions

83 playtesters in grades 3-5 (ages 8-11)

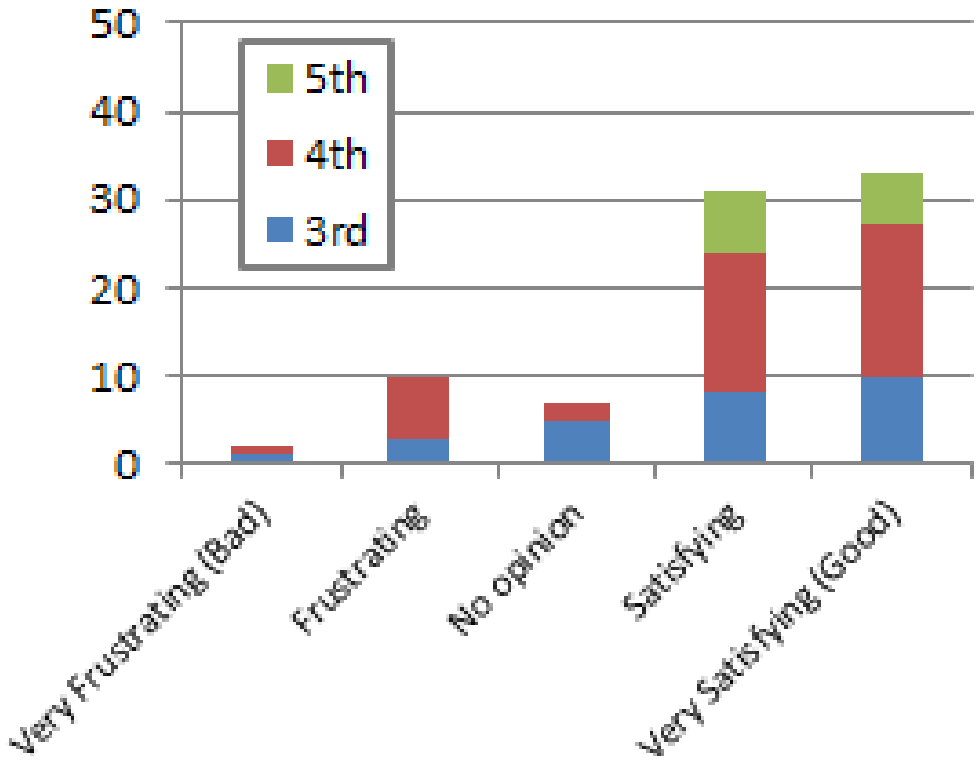
Response to “I know more about the fish.”



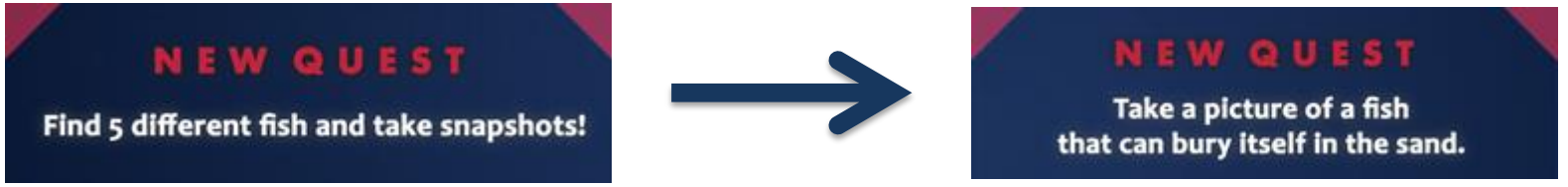
Imagica: Child Reactions

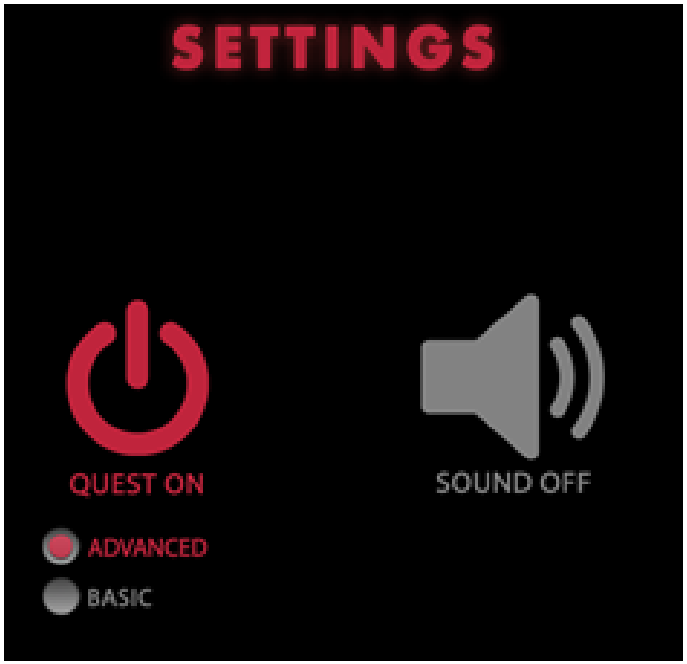
83 playtesters in grades 3-5 (ages 8-11)

Response to “Solving quests is ….”



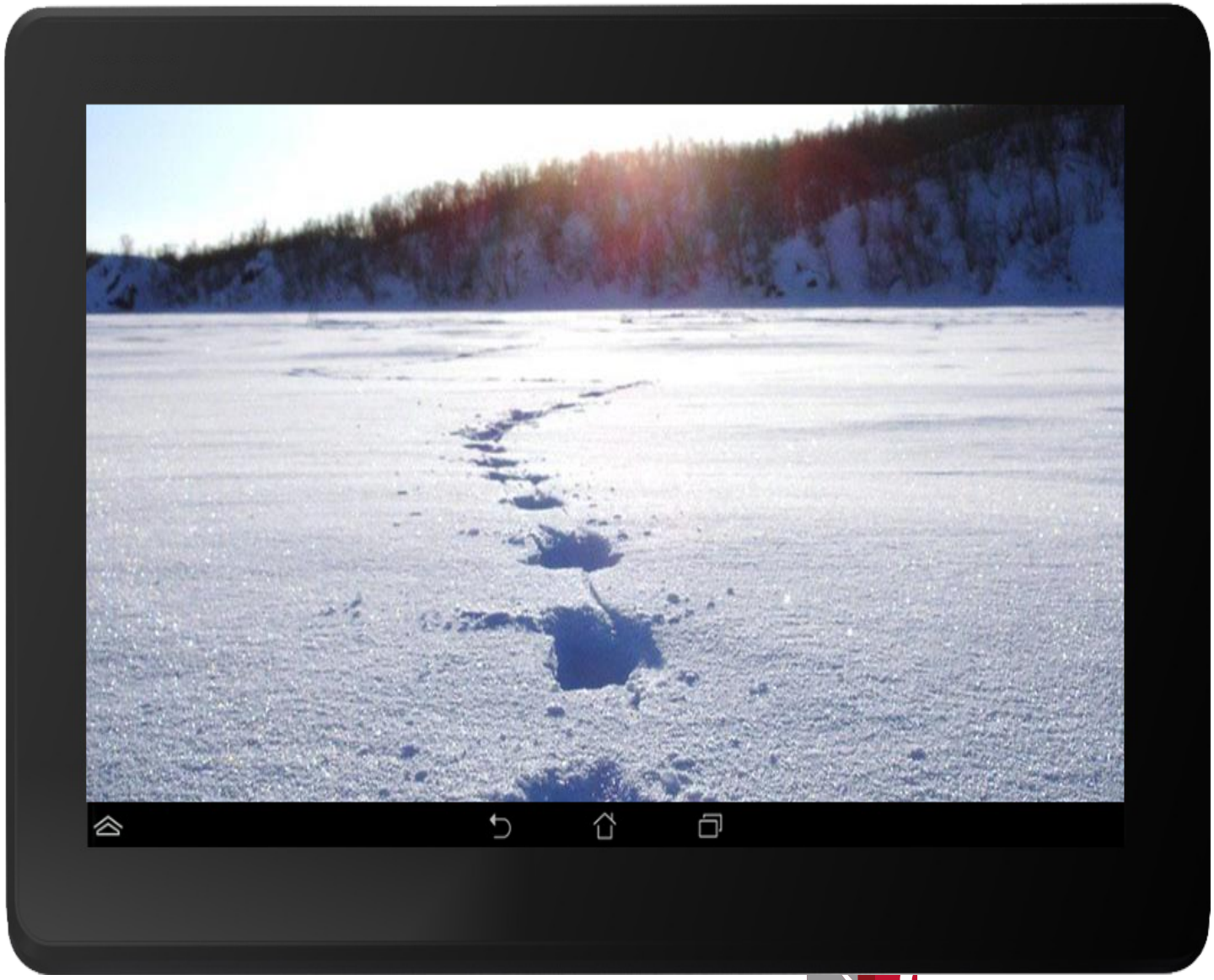
Imagica: Updated Quests





YETI and the Arctic Tundra

- High visual fidelity, high navigational freedom tablet experience



Y.E.T.I. Classroom Playtest

- ~65 children (grades 3-5)

- Main playtest goals
  - Response to mechanics
  - Response to objectives
  - Information retention

- Data collection
  - Observation
  - Interviews
  - Written surveys
  - Data from Amazon Web Server game logs

Y.E.T.I. Playtest Lesson

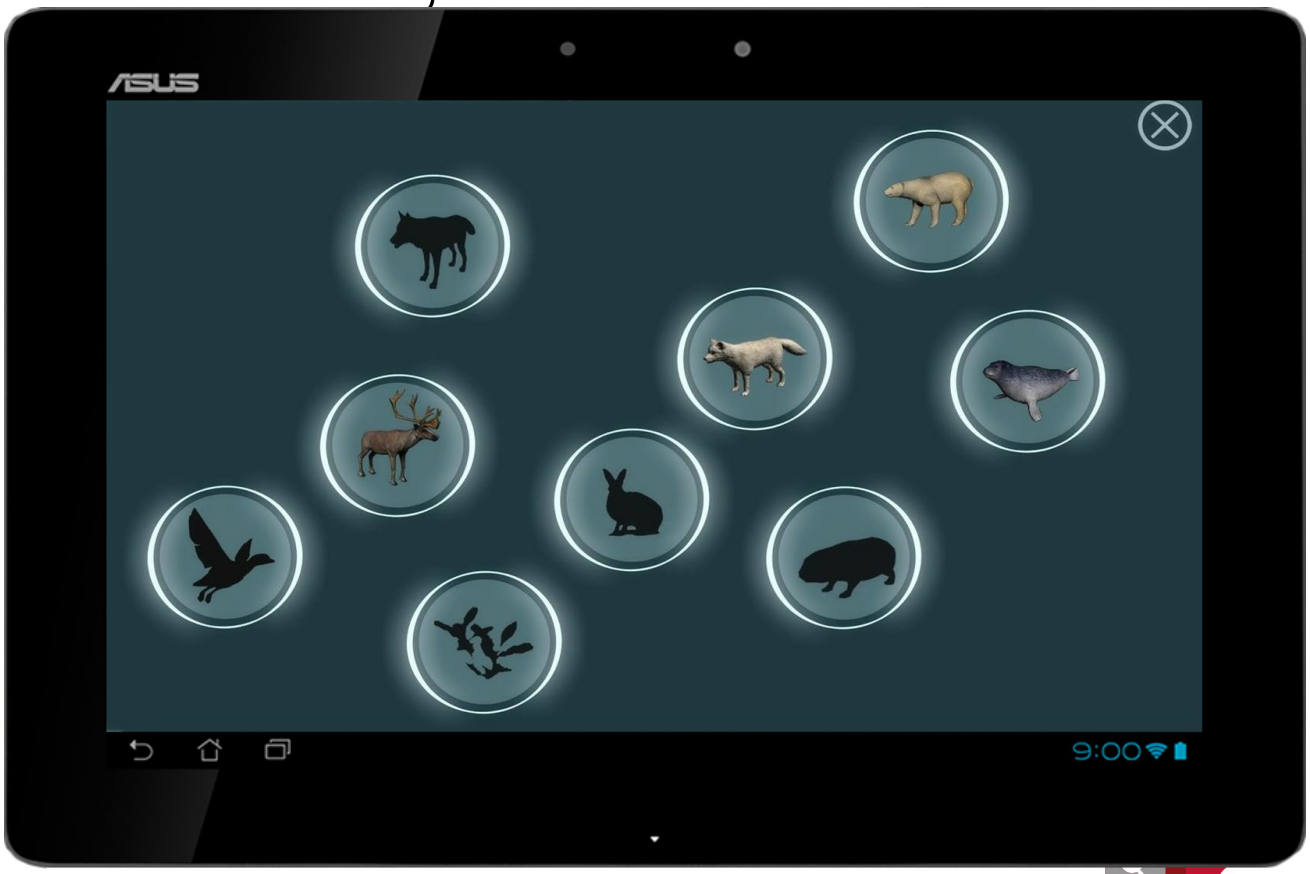
Virtual joystick was generally well understood

Sneak button was initially a source of confusion

Y.E.T.I. Revised Clue Feedback

Teaching Standards

- SC.O.4.2.8 - Construct and explain models of habitats, food chains, and food webs

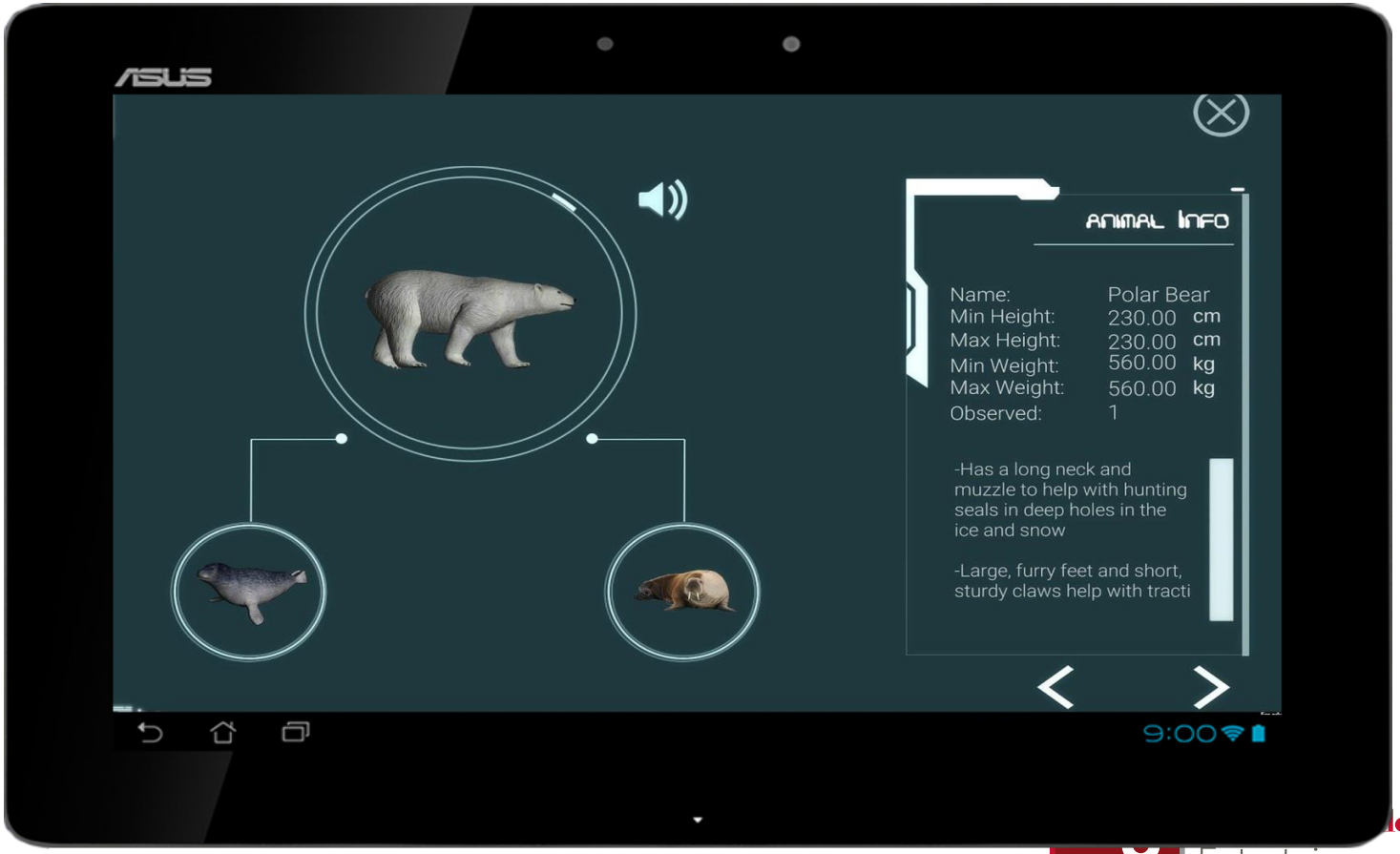


Teaching Standards

- SC.O.4.2.8 - Design and conduct simple investigations; observe, collect and record information

Teaching Standards

- SC.O.4.2.8 - Describe the different characteristics of plants and animals, which help them to survive in different niches and environments



Y.E.T.I. Later Playtests

- 14 children ages 8-11 outside of school
- 71 students in 4 classrooms at the client school (2 classes who saw the earlier version and 2 fresh classes)
- 20 students at the school who saw an earlier version for their commentary on the final release

Y.E.T.I. Playtest Insights

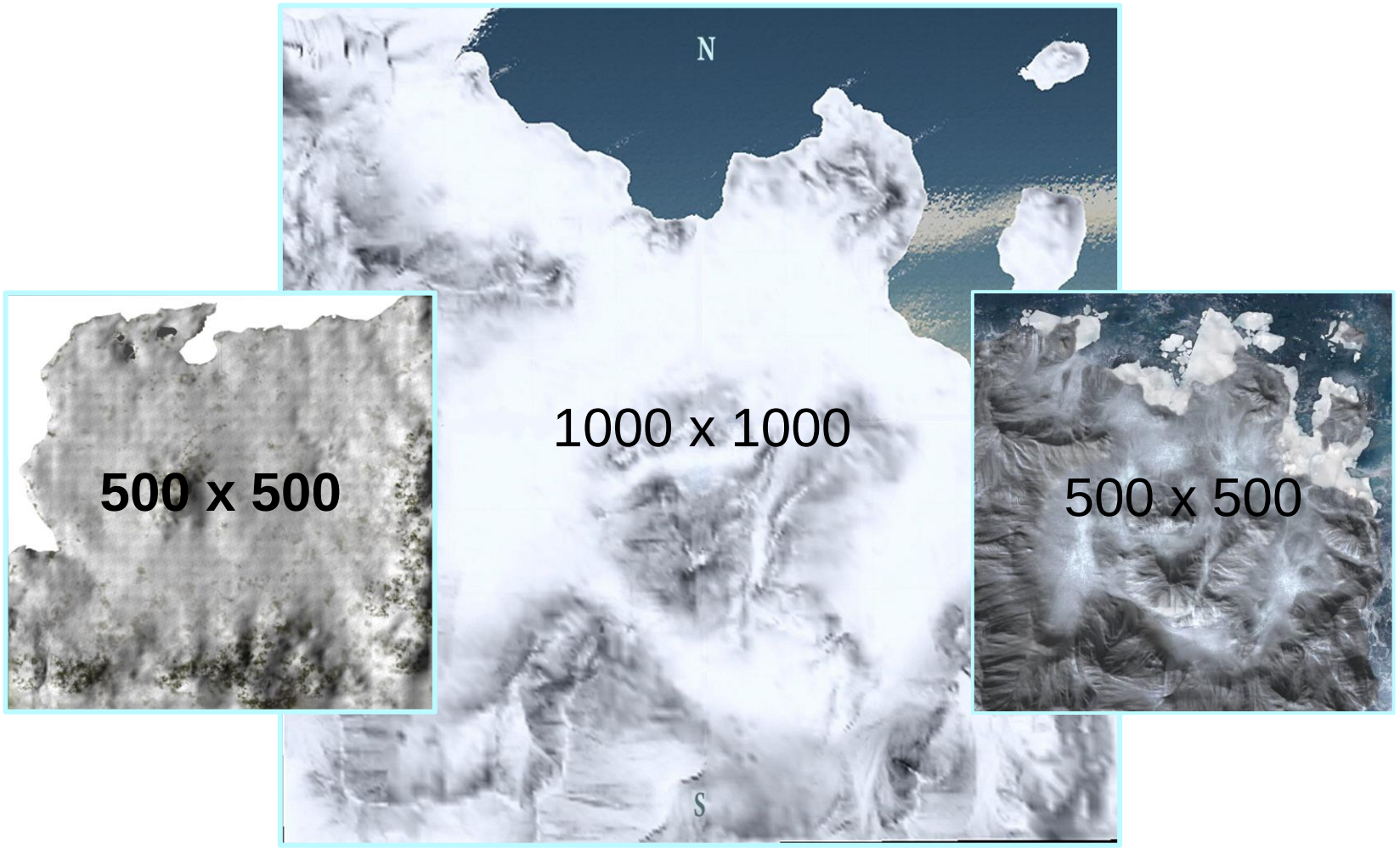
- Persistent attempts to use gestural and touch input (e.g., binoculars, zoom)
- Lack of tactile aspect for virtual joystick affected usability

Y.E.T.I. Interface Adjustments

Snap to Finger

Finger-guided camera

Y.E.T.I. Revised Terrain



Y.E.T.I. Highlights

- Revised terrain more interesting and “vast”
- Animations between animals rewarding
- “Juicy” surprise elements rated highly:
  - Animal vocalization in the logbook
  - 3D rotating of scat clues in field
  - Richly colored thermal view

Y.E.T.I. Final Interface

Playtesting

- Product development, e.g., testing an iteration cycle
- Playtest to explore, to refine, and to prove
- See playtestingworkshops.com

COLLABORATION OF:

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Human-Computer Interaction Institute
HCII

Carnegie Mellon University
Entertainment Technology Center

For Further Information

- ETC: www.etc.cmu.edu
- Playtesting: playtestingworkshops.com
- *Hello Ocean* from ETC Project Imagica, http://www.etc.cmu.edu/projects/imagica/
- *Arctic Stars: The Far North* from ETC Project Y.E.T.I., http://www.etc.cmu.edu/projects/yeti/

Other questions? Email Mike Christel, christel@cmu.edu