TPEA 35th Annual Conference (3rd – 4th July 2023)

A Service Design Approach:

What are the barriers and opportunities of using Augmented Reality for primary science education?

Warren Fearn
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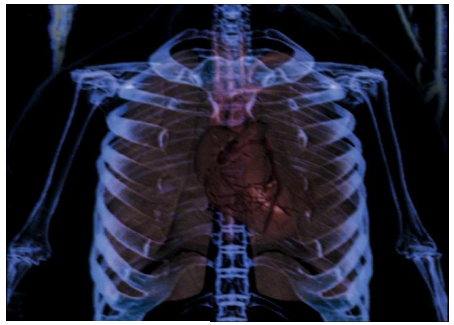
Est. 1841 | YORK ST JOHN UNIVERSITY



BBC

ARGON (Ar)

Point your **iPhone**, **iPod Touch** or **iPad** at the marker to view a 3D hologram

Discovered:	1894
Atomic Number:	18
Atomic Weight:	39.948
Density At 0 C:	101.325 kPa
Melting Point:	-189.35 C
Freezing Point:	-189.2 C

Argon (symbol Ar) is a colorless and odorless gas, makes up 0.93% of our planet's atmosphere. This makes it the third most abundant element in our atmosphere after nitrogen and oxygen. It is a noble or 'inert' gas, found in group 18, period 3 of the periodic table which does not react with other elements under normal conditions.

Uses: You can find Argon used in light bulbs, lasers, double glazing for home and even scuba dry suits!

AUTODESK

ncfe. nocn
CREATING OPPORTUNITIES

(Akcayir, Akcayir, 2017; Wang, et al., 2017; Radu, 2014; Yuen, Yaoyuneyong, Johnson, 2011), suggest educators and designers need to collaborate in terms of creating sound pedagogy to develop AR applications that maximise on learning outcomes.

A study by Silva et al. (2019) found that although educators did recognise the potential of AR, the adoption of such technologies within mainstream schools is rare.

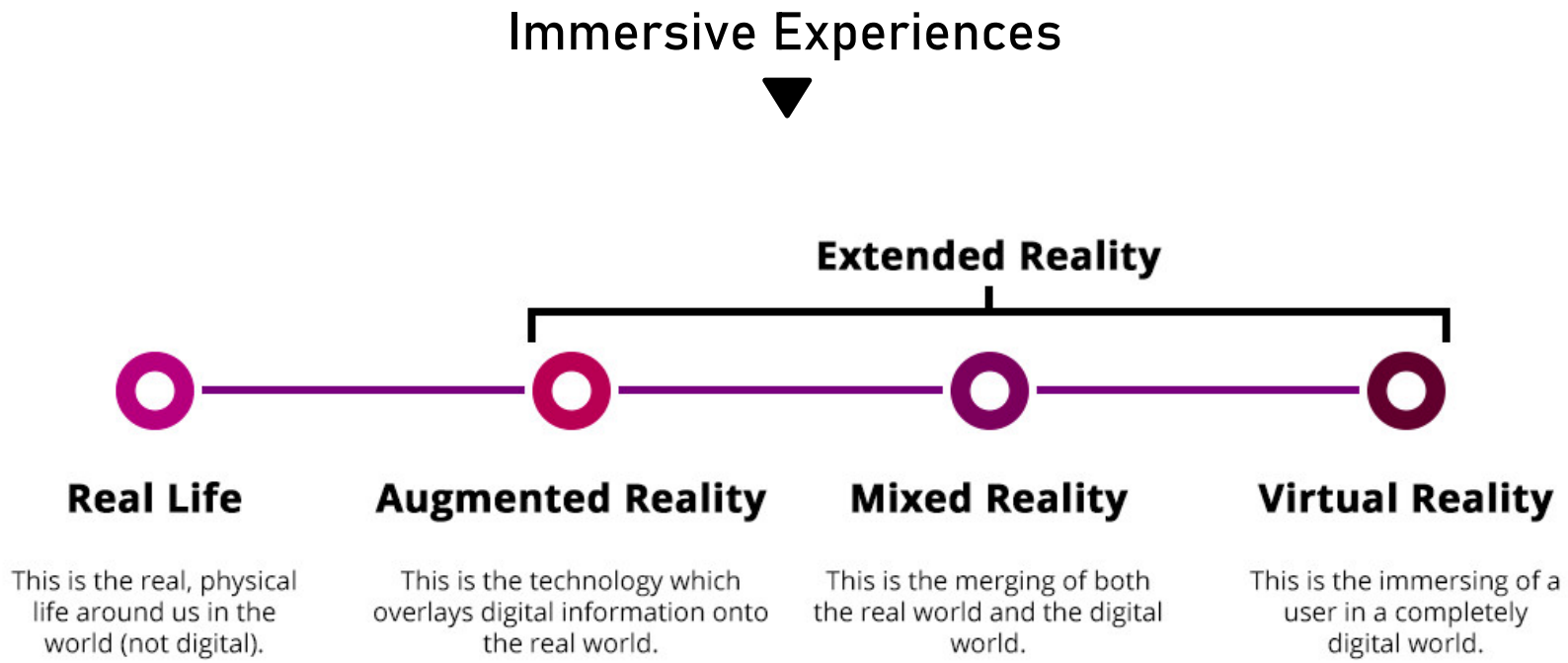
(Kerawalla, Woolward, Luckin, 2006; Bistaman, Idrus, Rashid, 2018) specifically demonstrate AR provides a positive impact on a teaching and learning experience for primary science education.

(Wellcome Trust, 2017) that primary teachers within the UK education system are now only managing to devote on average 1 hour and 24 minutes per week in teaching science

1) How can AR create new remote experiences outside of the classroom?

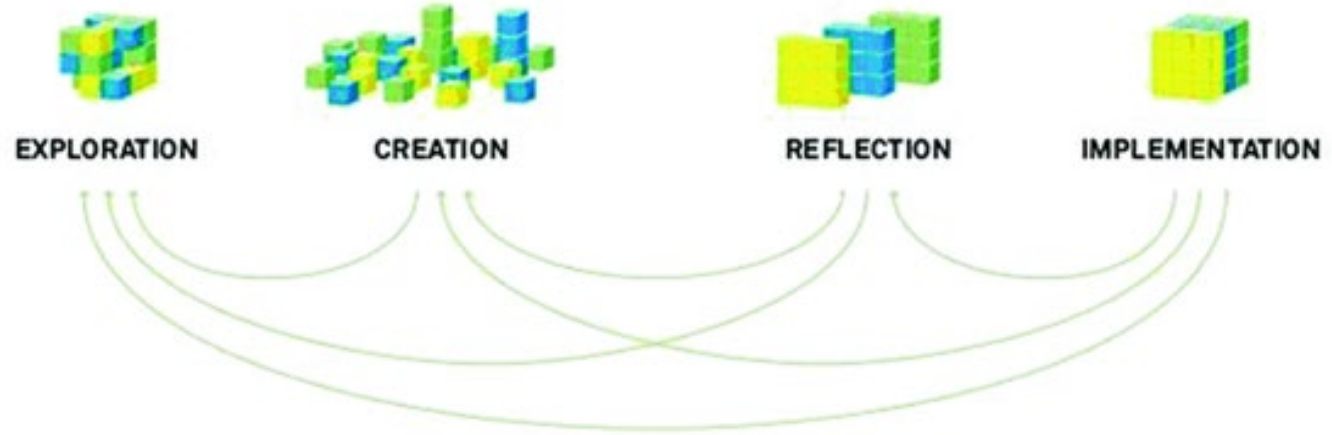
2) What are the barrier and opportunities for using augmented reality within schools?

Why use Service Design for AR?

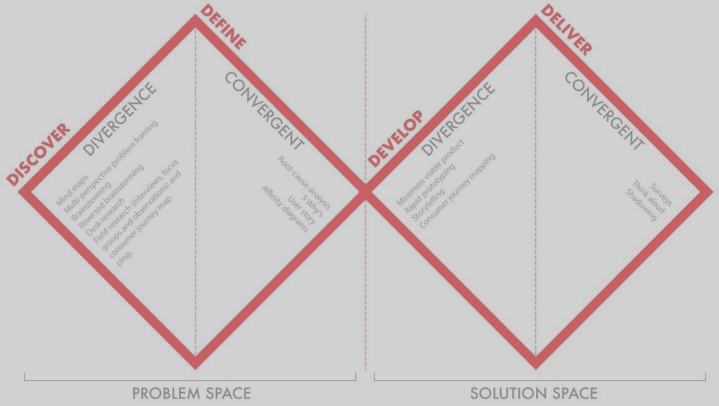


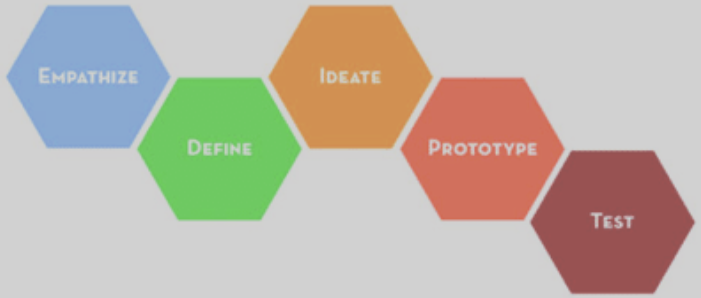
Design Methodologies

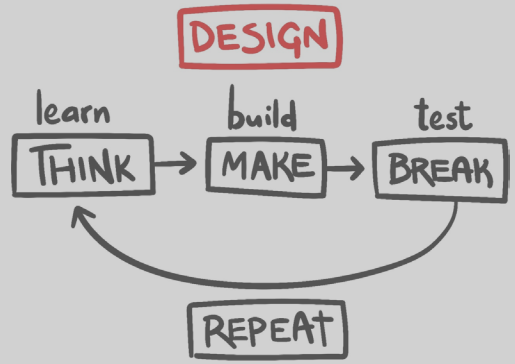
Service Design Thinking Process



Stickdorn, Hormess, Lawrence and Schneider (2018)
This is Service Design Thinking







5 Principles of Service Design

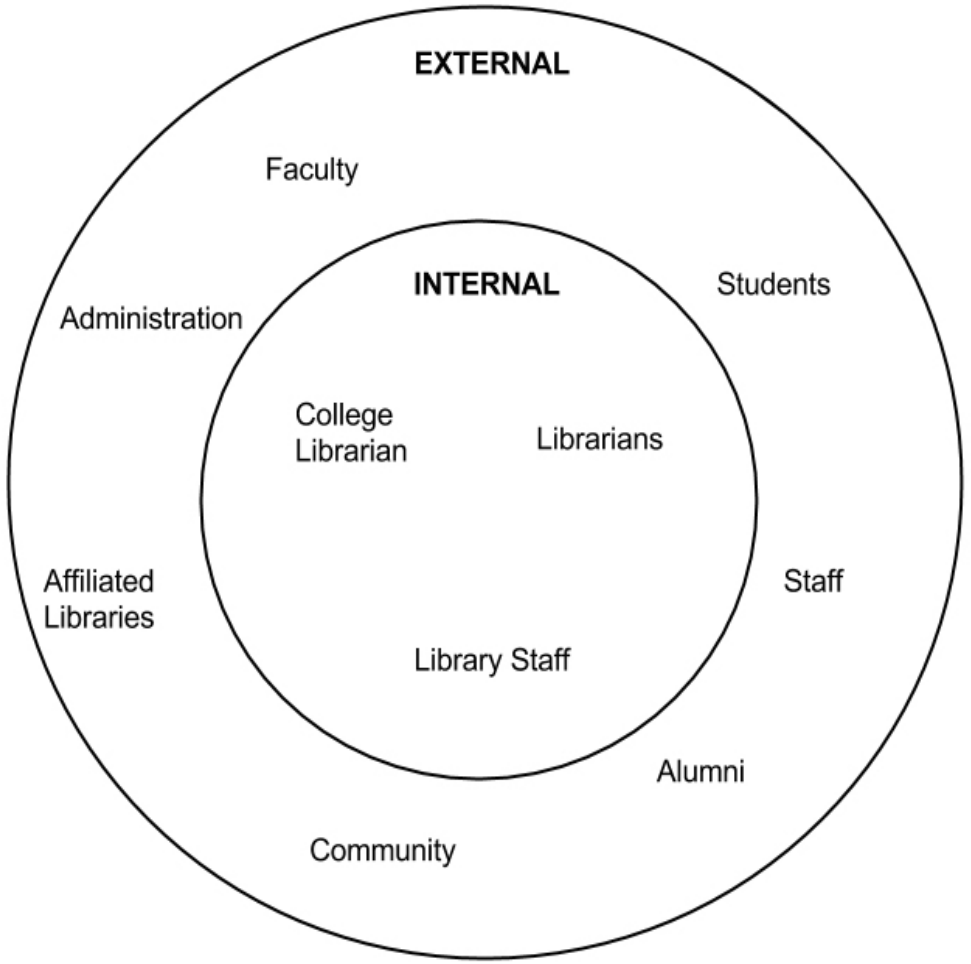
1. User Centred
Experiences are customer focused.

2. Co Creative
All stakeholders are part of the process.

3. Sequencing
The service should be visualized as a sequence of Interrelated actions.

4. Evidencing
The service should be visualized in terms of physical artefacts.

5. Holistic
The entire environment of a service should be considered.



Stakeholders

Education

Ebor Academy Trust, York, UK / Centre for Industry Collaboration
York St John University, Education Department / EPIC Games, Education Manager.

Tim Moat

Director of Communications and Development
Ebor Academy Trust
York
UK

Jake Reeves Kemp

Computing Specialist Lead
Ebor Academy Trust
York
UK

Emma Davies

Science Academy Leader
Ebor Academy Trust
York
UK

Nicky Waller

Primary Science Advisory Teacher at CIEC (Centre for Industry, Education & Collaboration)
University of York
UK

Dr Katy Bloom

Associate Professor
School of Education, Languages, and Psychology
York St John University
UK

.....and KS2 pupils.

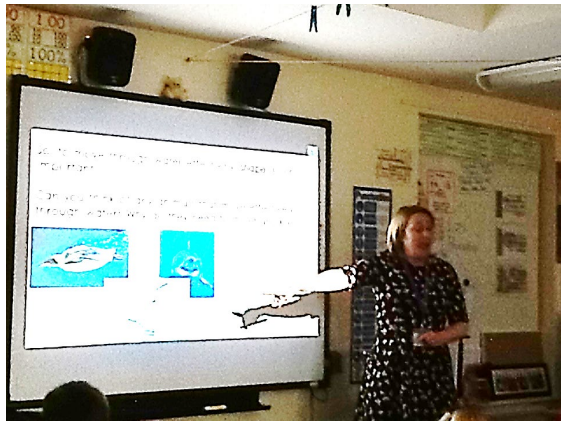
Exploration. Methods.

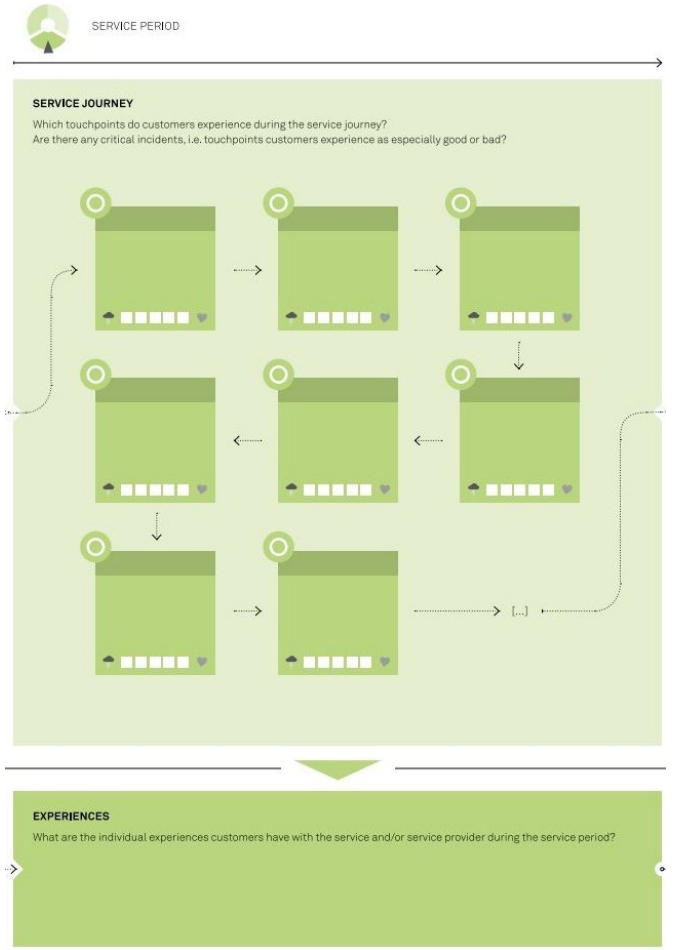
Service Safaris
Classroom Observations
Shadowing - Day in the life (Teacher/Pupil)

Contextual Interviews
In-depth conversations (Teacher / Pupil)
What do they want / need?
Where are there barriers and opportunities?

Customer Journey Maps
What are the key touchpoints?
Emotional Implications.
Empathy.

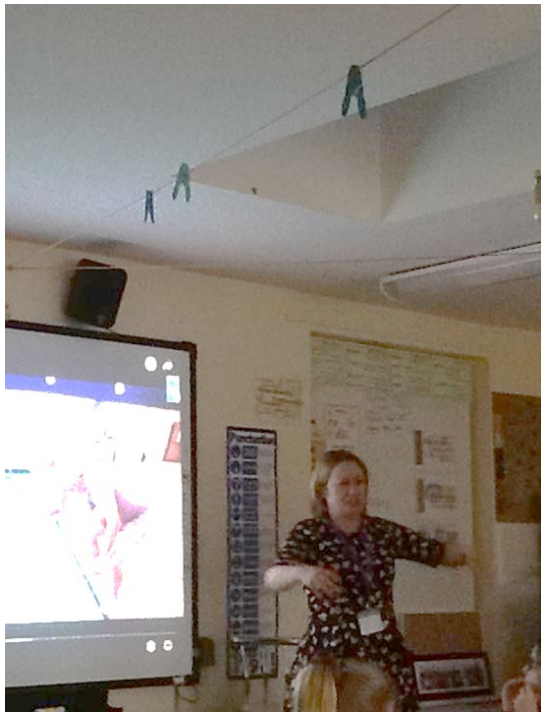
Questionnaire
Distributed out to primary schools in England
57 responses

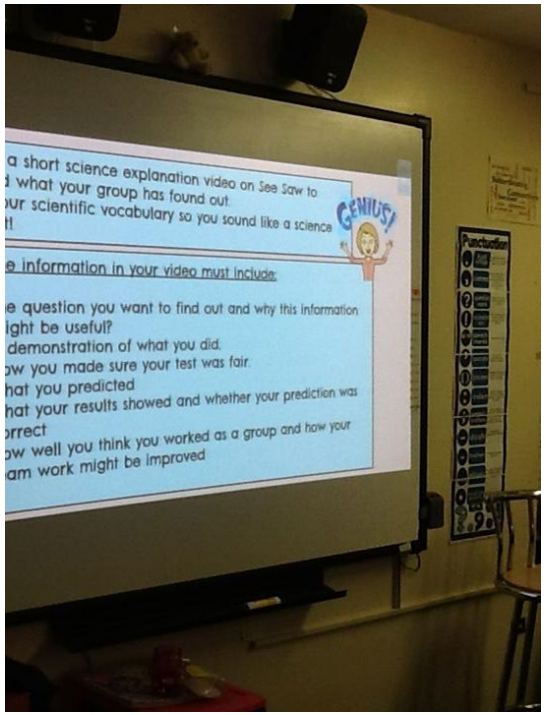




Robert Wilkinson Primary Academy, York, UK.

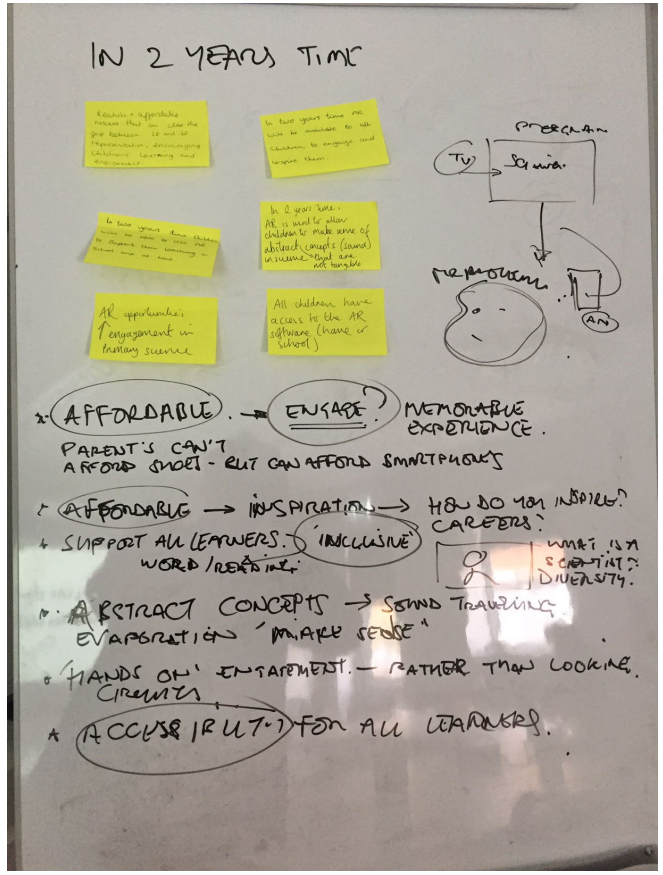
Exploration: Classroom Observations

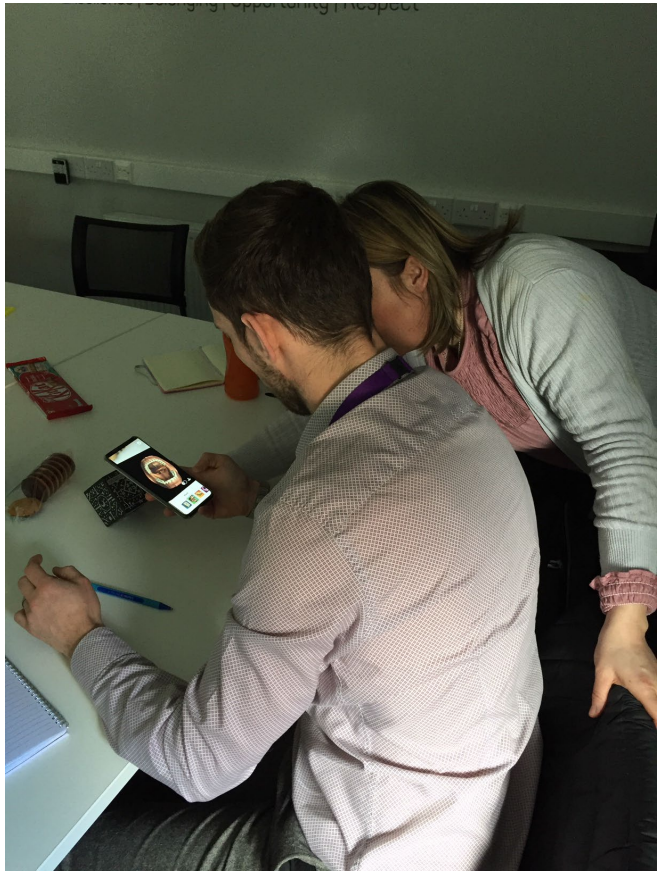




/ Comical Videos / Stories happened / Activities / Delivery

Exploration. Focus Groups / Design Sprints

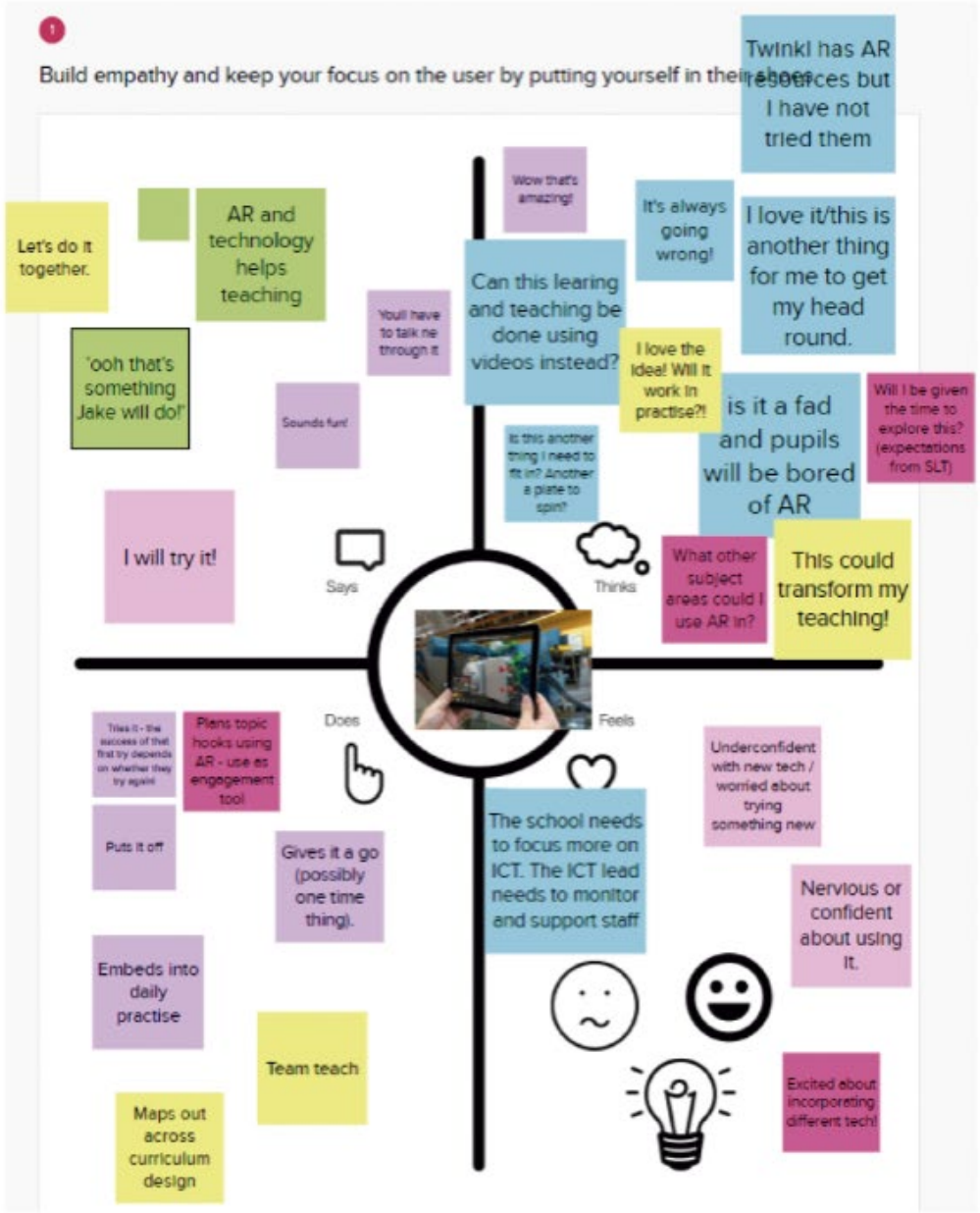


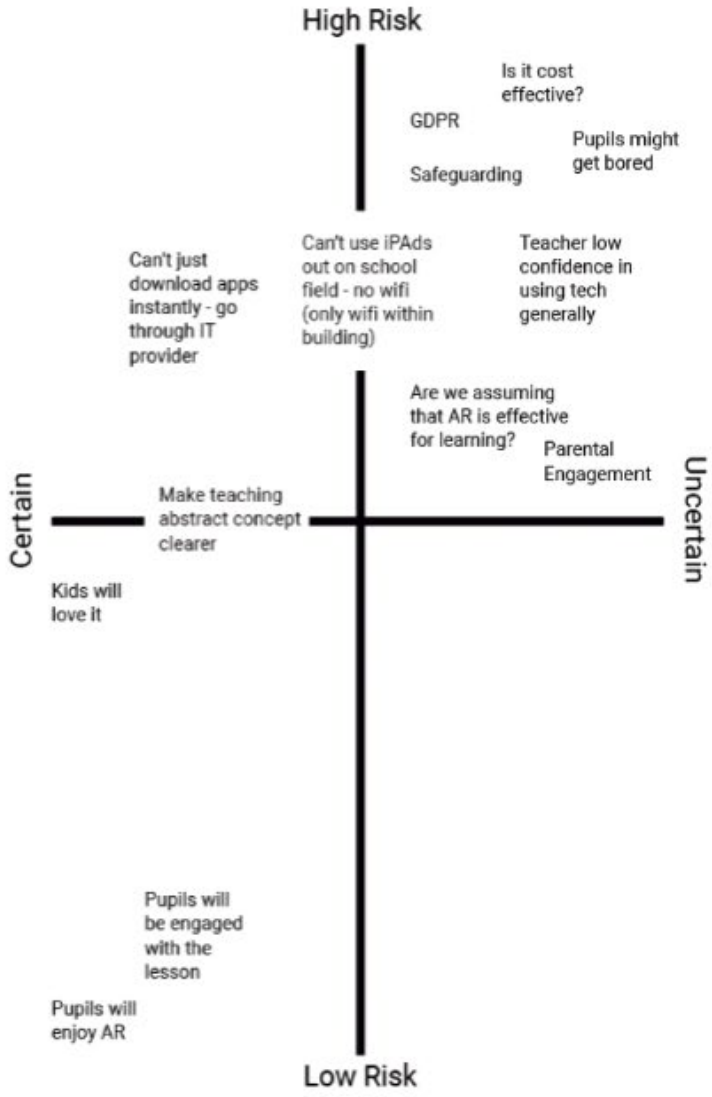


/ Exploring AR products / What do you think?

Exploration. Empathy Mapping

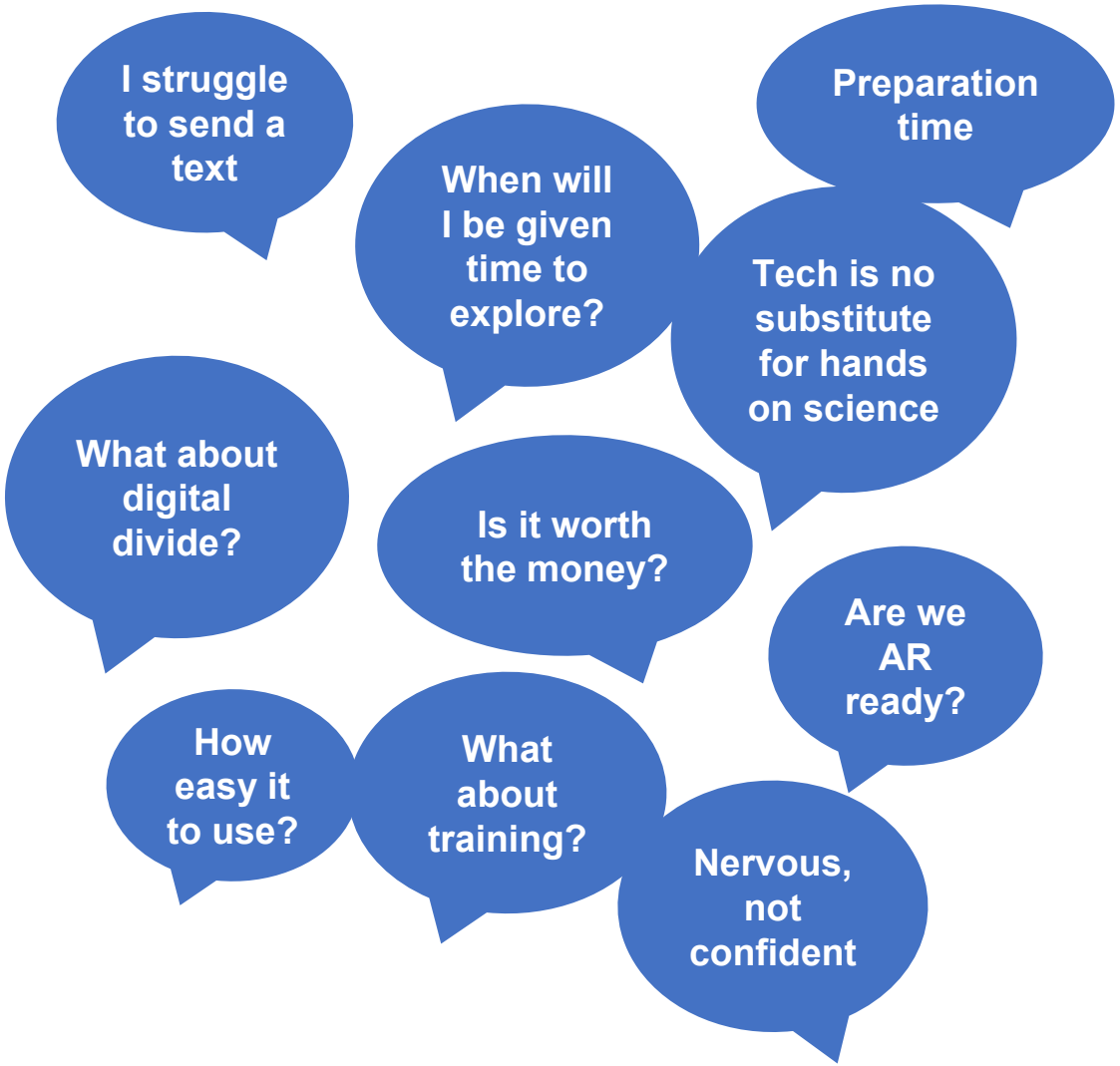
Exploration. Empathy Mapping



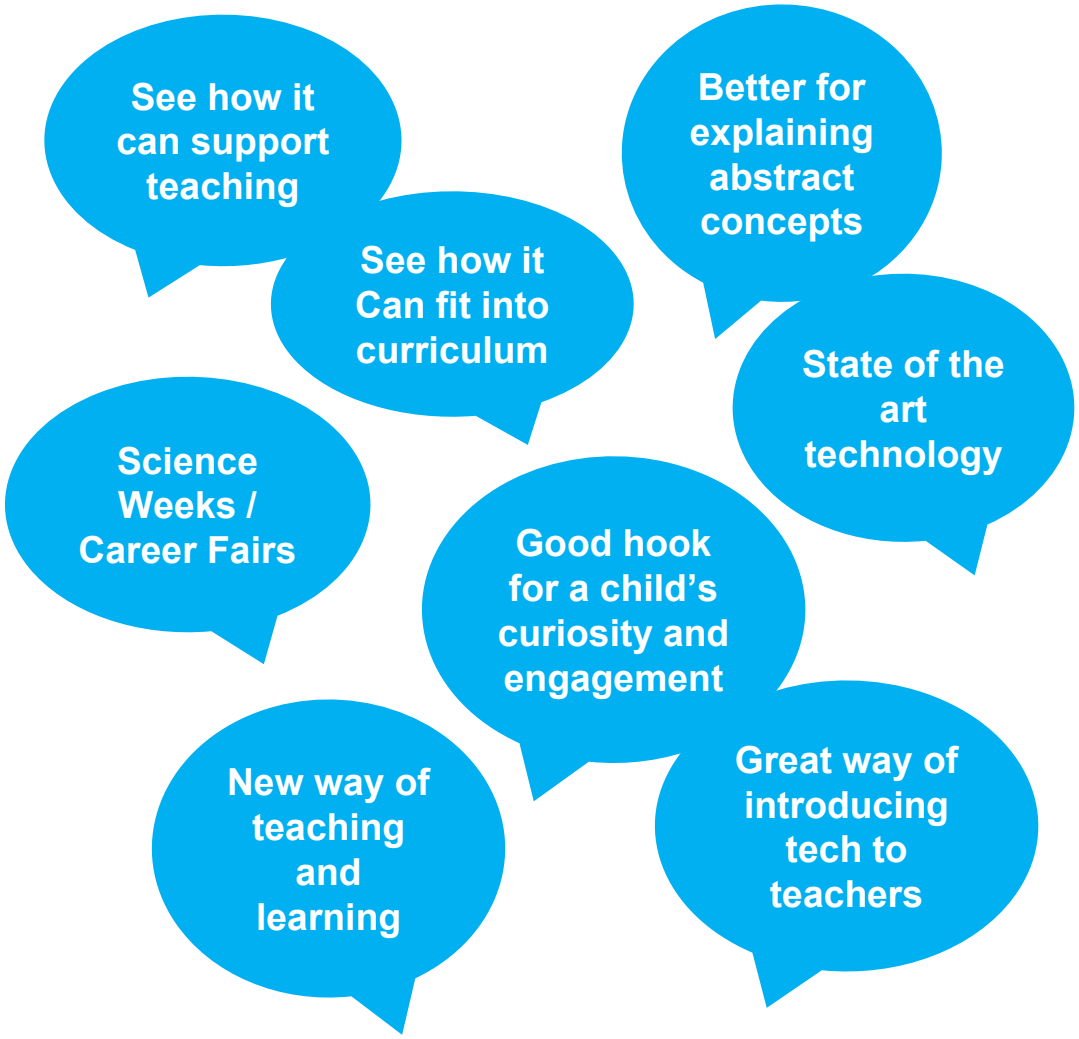


Exploration. Empathy Mapping

Challenges



Benefits



Exploration. Summary

Challenges

Affordability & Investment
Teacher Attitude & Confidence
IT Infrastructure
Time Preparation
CPD & Training
Inclusive
Digital Divide
Access to Devices / Platform
Level playing field
Funding for resources

Opportunities

Curriculum Alignment
Cross Curriculum
Connecting Science to Real Life
Engaging in unique ways
Science Capital
Relevance to Real Life
Abstract Concepts
Deep Dive
Blended Learning
Active & Engaging

VR & AR Applications

28 % - YES

72 % - NO

Class Sizes (30 above)

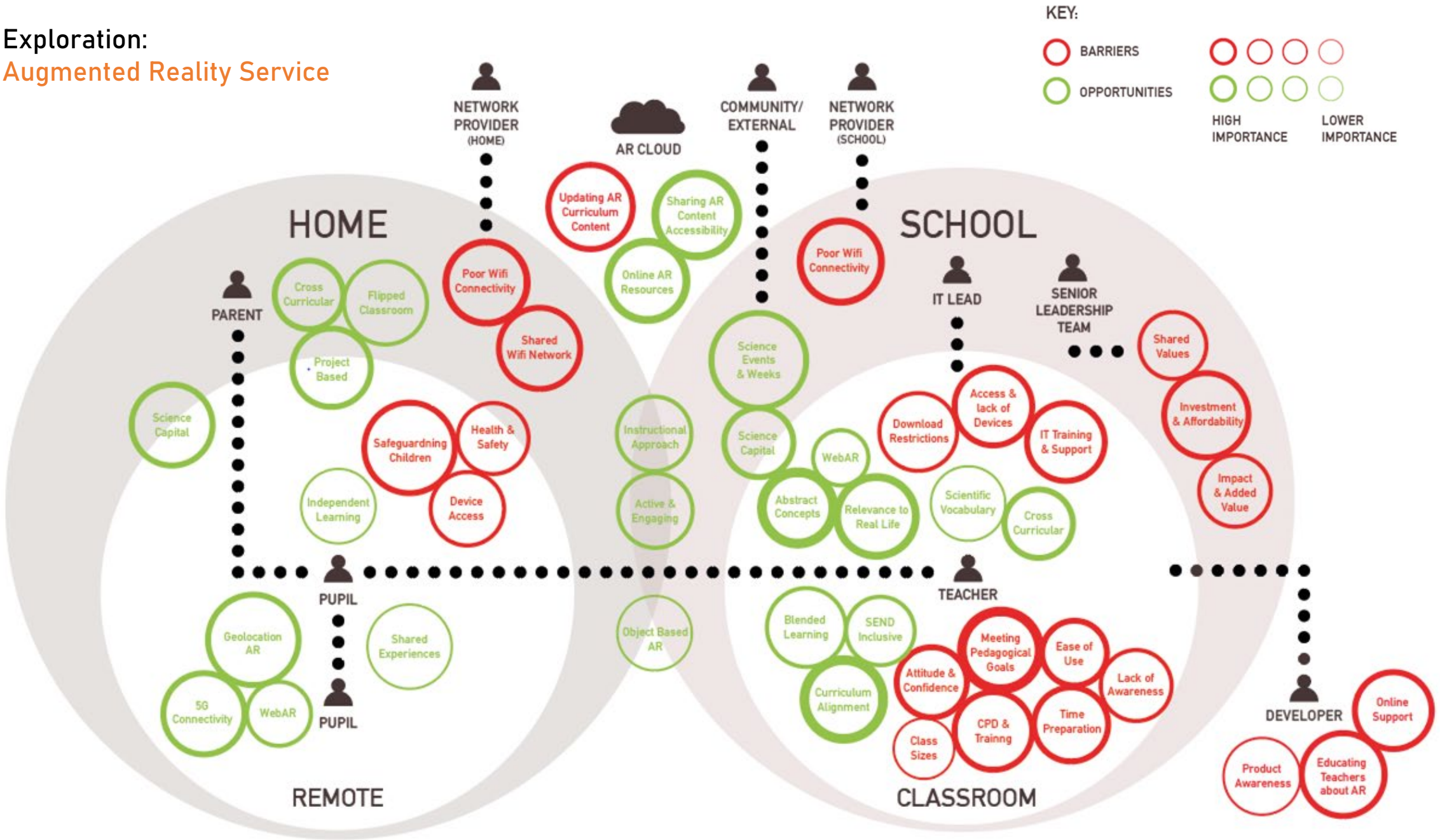
64%

Teaching Science

30% - 2 hrs per week
19% - 1 to 2 hrs per week
19% - 1hr to 1.5 hrs per week
16% - 1.5 hrs per week
14% - under 1hr per week
2% - only half term

Fearn, W., & Hook, J. (2023). A service design thinking approach: What are the barriers and opportunities of using augmented reality for primary science education? Journal of Technology and Science Education, 13(1).

Exploration:
Augmented Reality Service



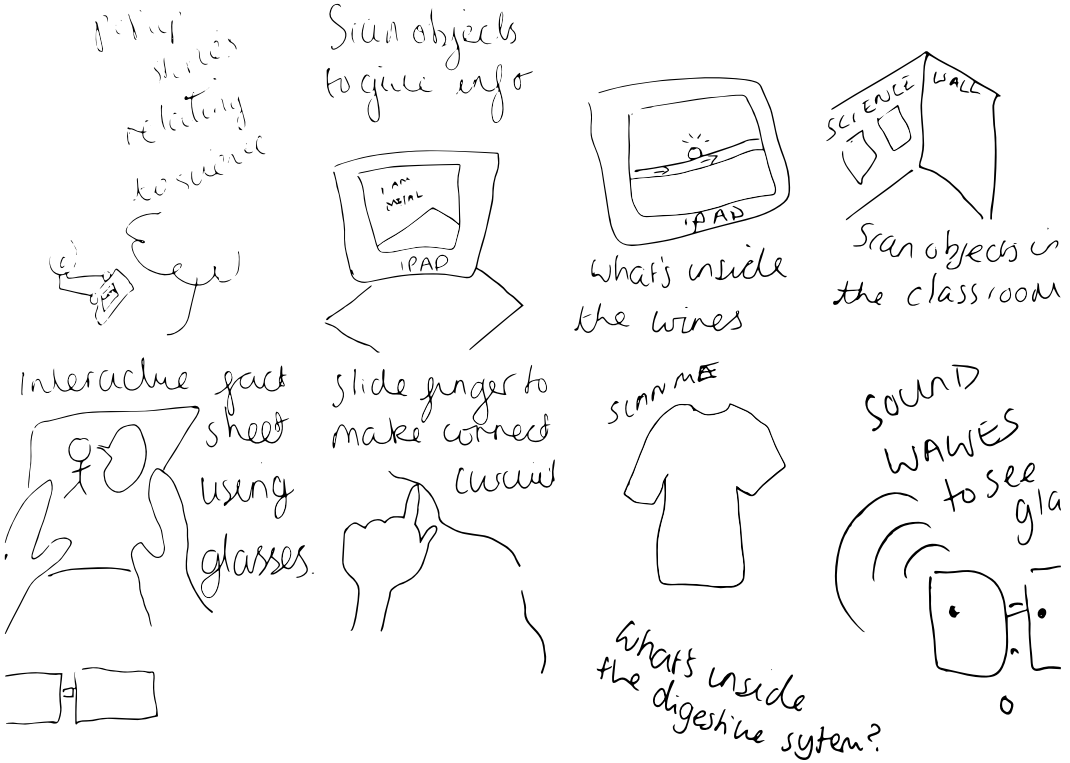
Creation. Design Scenarios. & Storyboards.

Design Scenarios

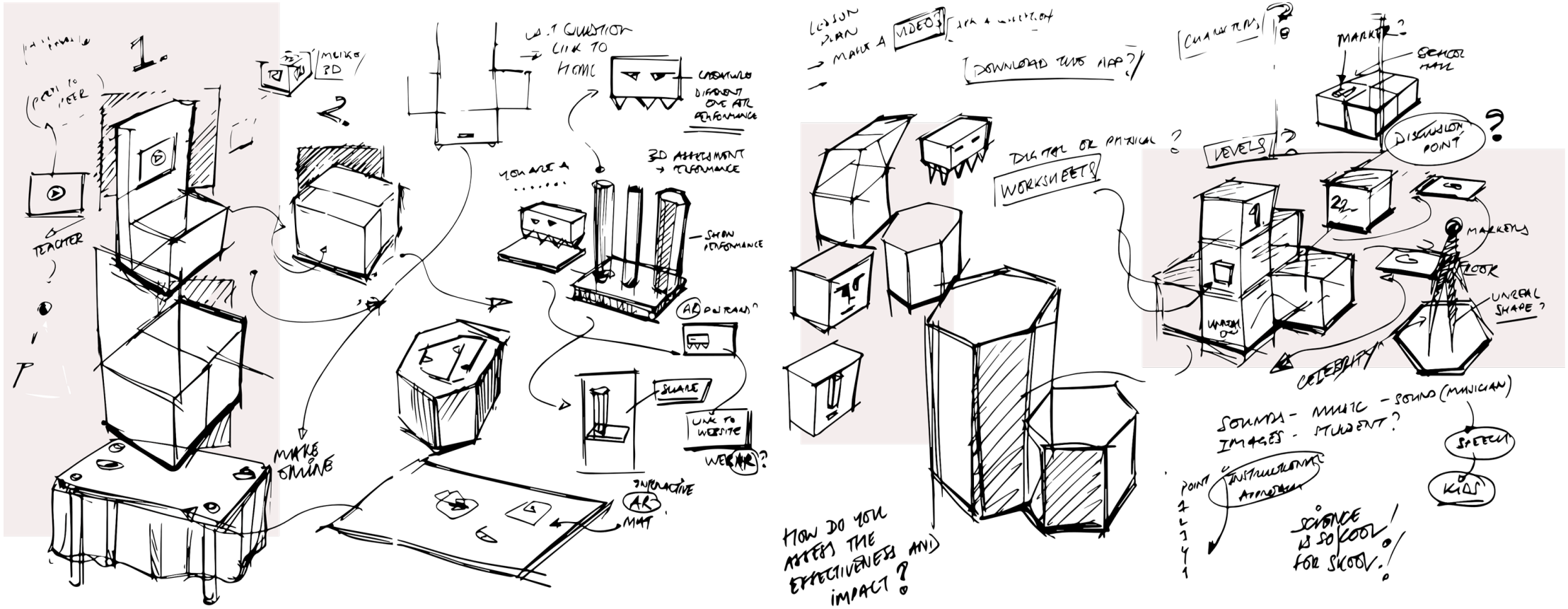
used to explore solutions, prototype scenarios and experiences.

Storyboards

to illustrate a sequence of events
Crazy 8's.



Creation. Concept

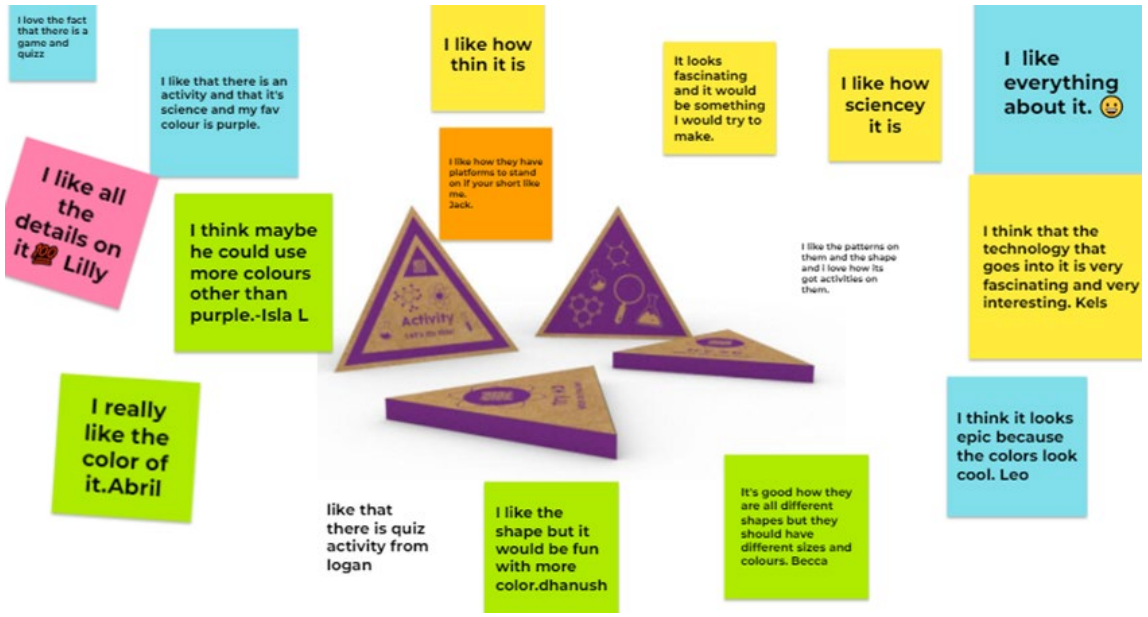


/ AR Pop-Up Exhibition

Creation. Concept

/ Science Event (time preparation)
/ Change Content (Cloud based)
/ Image Recognition
/ Contained under school infrastructure
/ Inclusive (no digital divide)

Exploration. Empathy Mapping



/ EPIC / SIC

Epic SCIENCE

Creation. Themes (Climate Change)

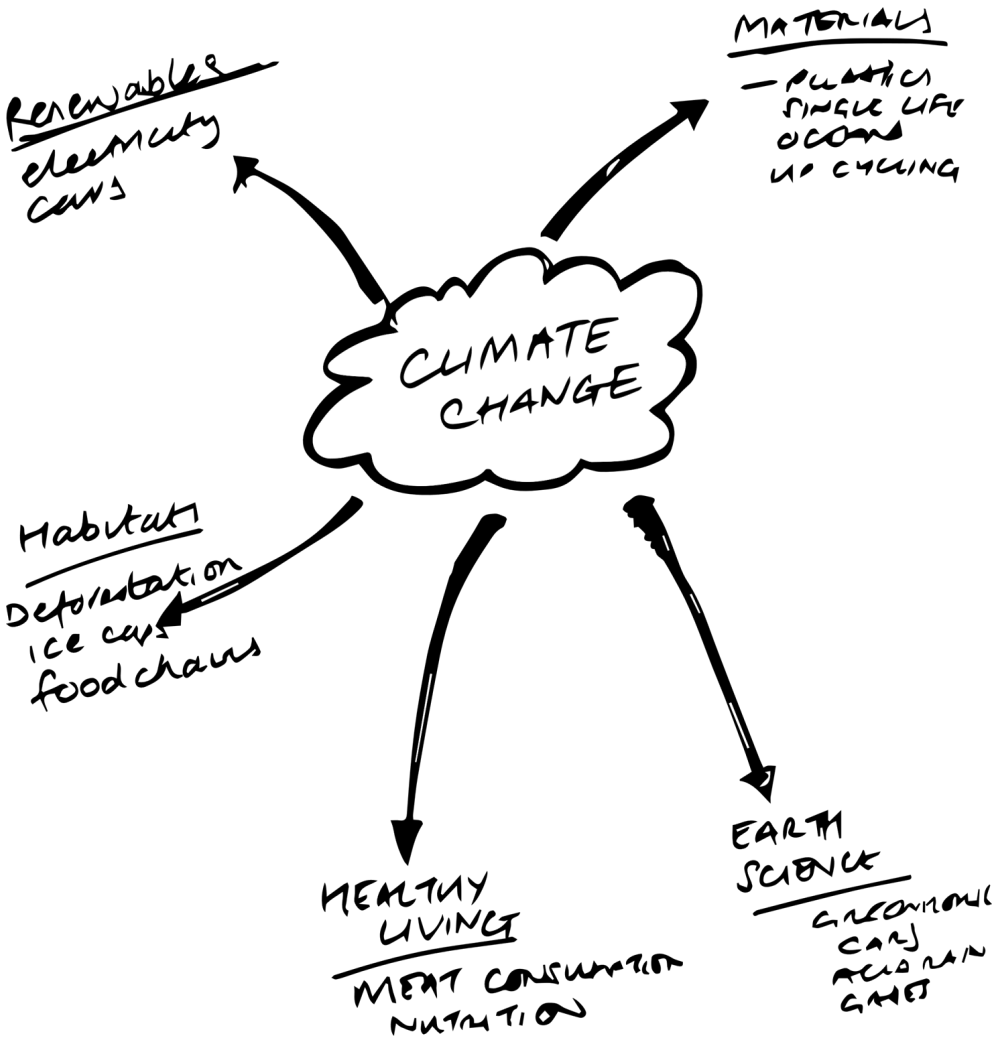
1. Renewables
Touching on the wind turbine (learning about parts of the turbine)

2. Habitats
Choosing options to help an animal survive. Shelter, food, water (problem solving)

3. Materials
Choosing which materials to remove from the ocean to stop pollution (gaming)

4. Healthy Living
What is a burger made from? (what's in a burger)

5. Earth Science
Character in a car, too hot. Using dial to get hotter and colder (slider to make temp hotter and colder)



Creation. Customer Journey Mapping

1 / QUESTIONS (3)

2 / DISCUSSION

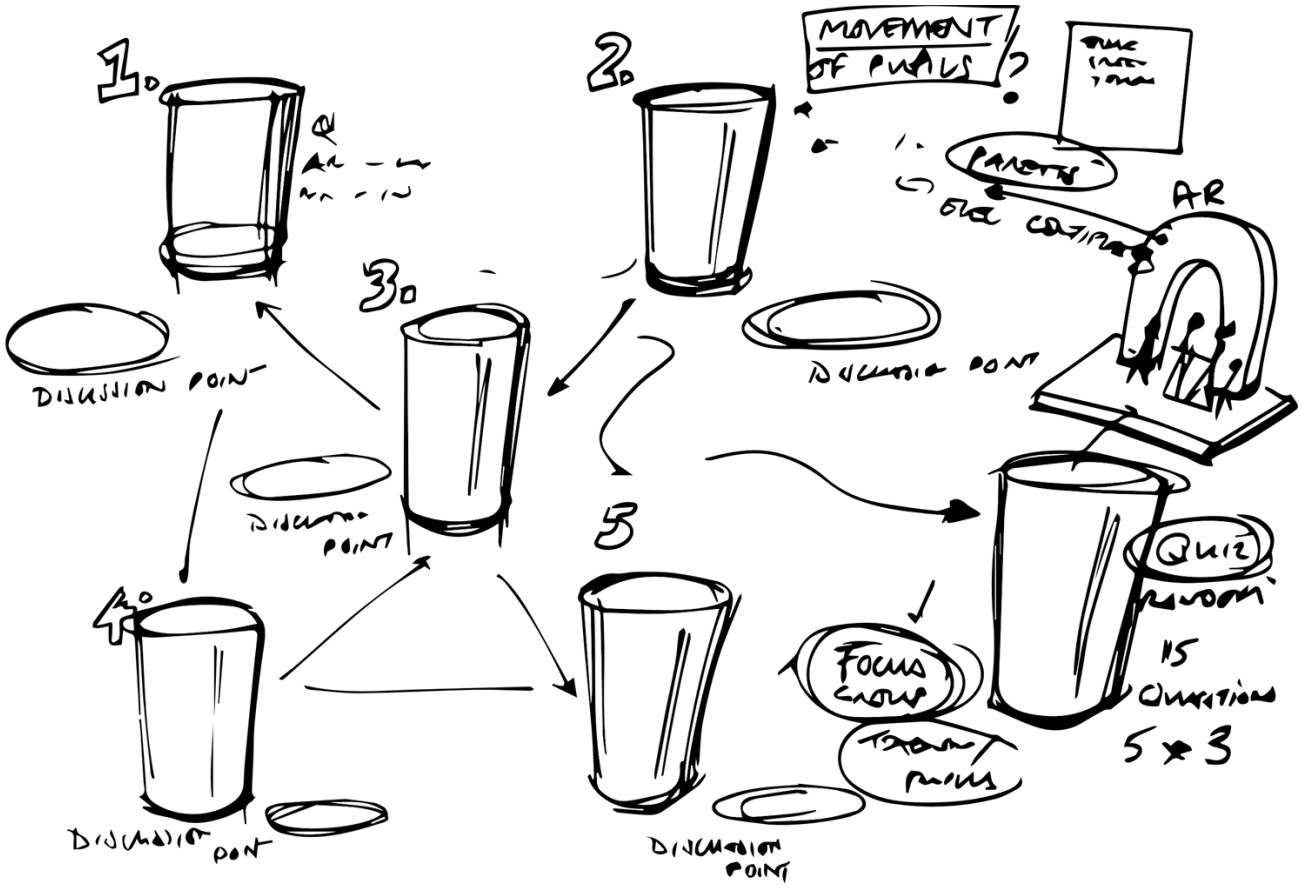
3 / AR VIDEO

4 /AR ANIMATION

5 /AR INTERACTION

6 / QUIZ

Creation. Customer Journey Mapping



/ Discussion Points

/ Environment
School Hall , Classroom

/ Style
(doesn't matter – more important content)

/ CPD Online Videos
Training and support

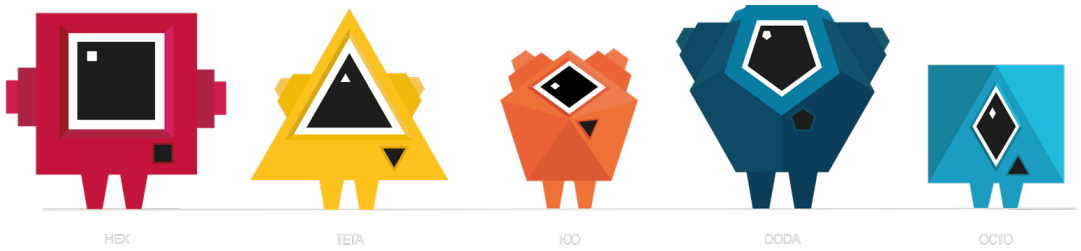
/ Accessibility
AR Roadshow , Ordered Online

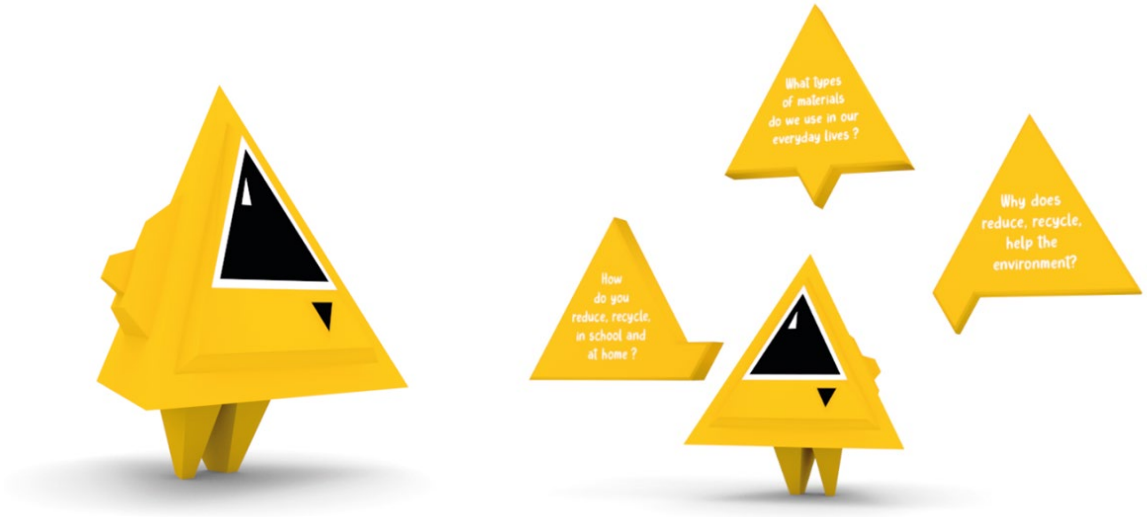
/ Worksheets (95%)
different learning styles and record

/ Science Capital (63%)
Triggering experiences from home
Type of Device (Tablet vs Phone) screen size

Creation. Concept

/ Platonic Solids





Creation. Storyboarding

3.

Narration:

(12 Seconds)

FRAMES
1525 - 1825

Located above the forest floor is the understory layer. Small shrubs and trees can grow here. Understory plants often produce flowers that are large and easy to see.

(Animate the visibility of each layer)

(12 Seconds)

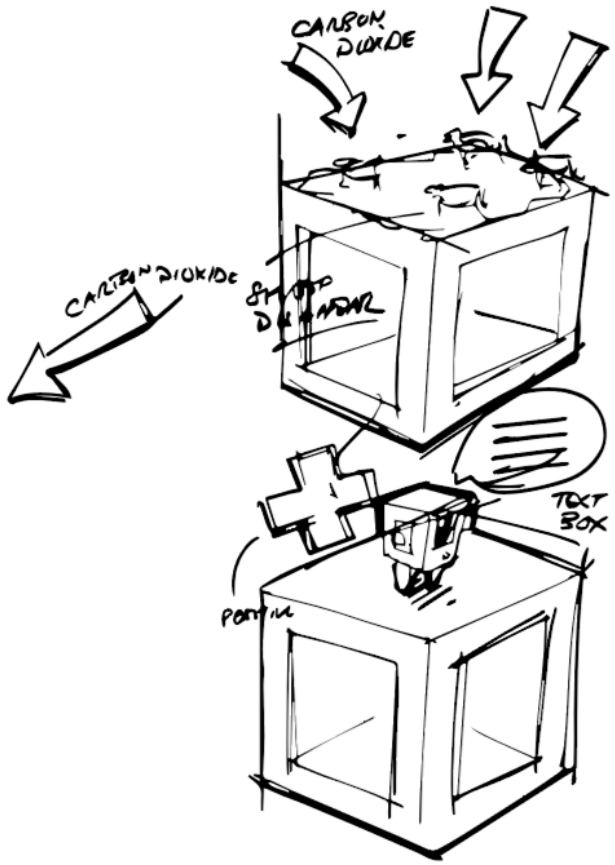
FRAMES
1825 - 2125

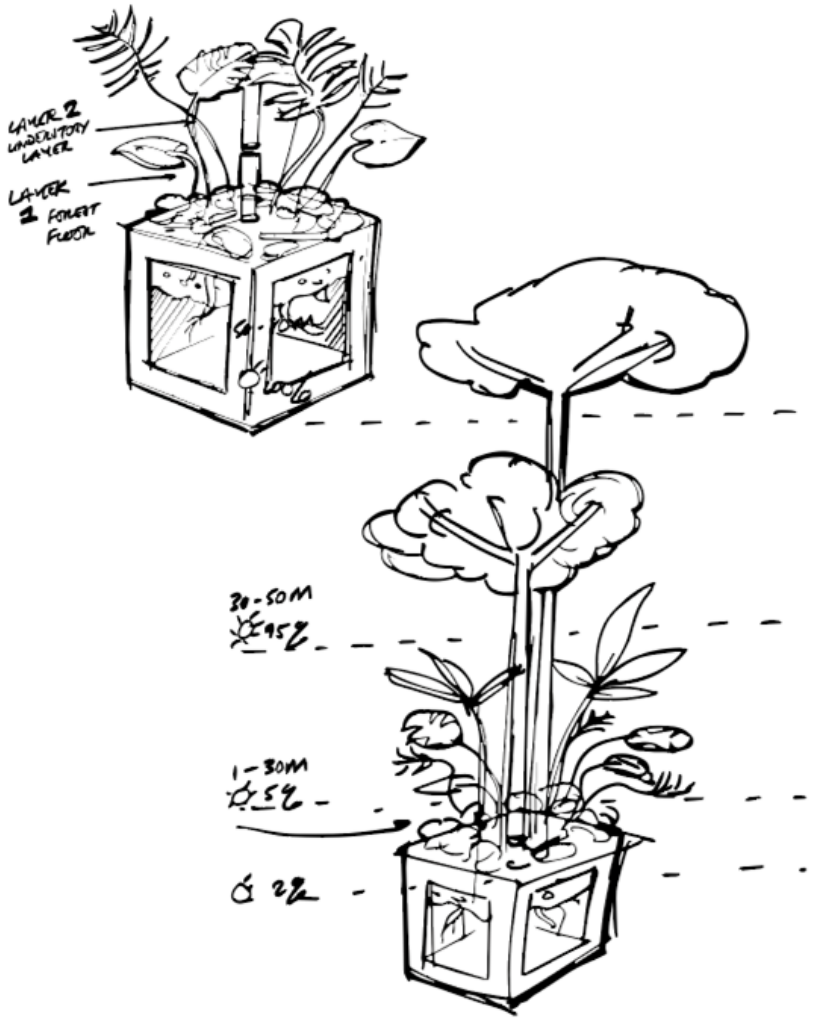
The canopy layer forms a dense network of leaves and branches as a roof over the two remaining layers. With so much food available, more animals live in the canopy than any other layer in the rainforest.

(11 Seconds)

FRAMES
2125 - 2400

The top layer of the rainforest is the emergent layer, where trees can grow up to 60 metres tall due to larger amounts of sunlight. Here, you will find living bats, butterflies and awaiting predators such as hawks and eagles.



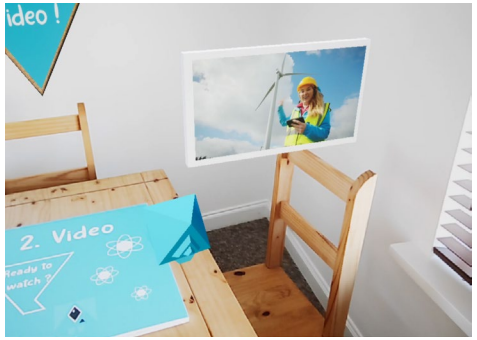


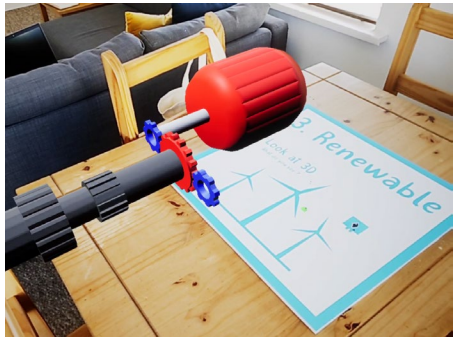
Creation. Concept

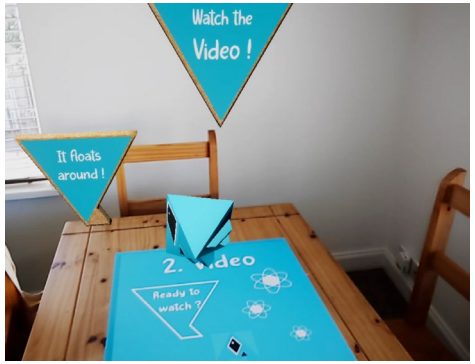
Creation. Concept

Creation. Concept

Creation. Augmentation







Epic SCIENCE

Implementation. Phase 2.

/ 6 to 8 Ebor Trust schools

How did the service work? What is the impact? Information needed to support teachers.

/ Pupil Quiz

Quizzes Software (Data Collection of 15 multiple questions) *Quantitative Data*

/ Focus Groups

Teachers & Pupils (What do they think of the AR experience? What are the peripherals? *Qualitative Data*

/ Observations

AR Interactions / Service. *Qualitative Data*

Epic SCIENCE

https://www.epic-science.com/

/ Brands

How will we work in the Metaverse? Roblox, Fortnite, Minecraft

/ New pipelines

to make things (take an image and convert into 3D textured model) AI

/ Geolocation

learn as you go (OECD – Future of Schooling)

/ WEB 3.0

Trigger 3D experiences without apps / triggers

/ Kiesha Matsuda – Hyper Reality

Thank you.

For more information:

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York Virtual / Augmented Reality Research Group

https://www.vr-ar.group/