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01 Ideation

Idea & motivation

Build an Augmented Reality (AR) App with 3D chemistry molecules for educational purposes


- Understand and learn chemical molecule structure
- Interact with 3D molecules to support the understanding
- The best way to learn: have fun! → Quizzes

01 Ideation

User stories, story board & personas

- Get into the topic
- Target audience + requirements → **specify the project scope**

Persona 1




Anton Ambitious

Age: 43
Location: Ingolstadt
Occupation: Chemistry Teacher
Family: married, one child

patient humorous
modern passionate

“I want to inspire hope, ignite the imagination and instill a love of learning.”

Persona 2



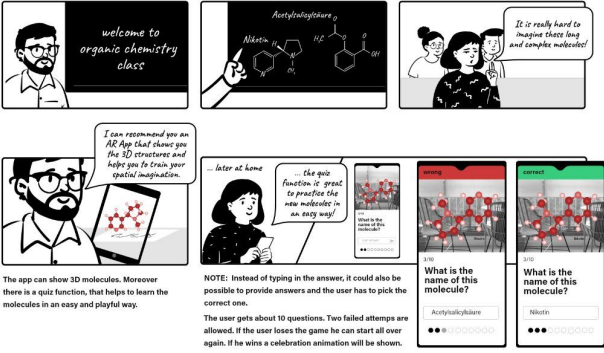
Clara Curious

Age: 23
Location: Munich
Occupation: Chemistry student
Family: In a relationship

striving cheerful
ingenious inquisitive

“I don't want to learn everything by heart. I want to understand.”

STORYBOARD



The app can show 3D molecules. Moreover there is a quiz function, that helps to learn the molecules in an easy and playful way.

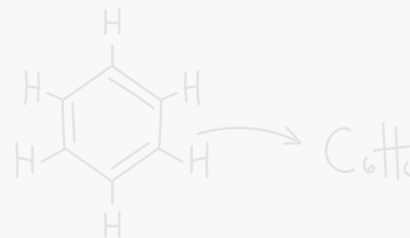
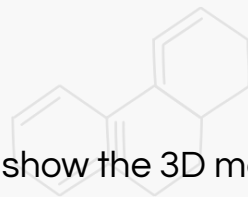
NOTE: Instead of typing in the answers, it could also be possible to provide answers and the user has to pick the correct one.

The user gets about 10 questions. Two failed attempts are allowed. If the user loses the game he can start all over again. If he wins a celebration animation will be shown.

02 Project scope

The Plan / To Dos

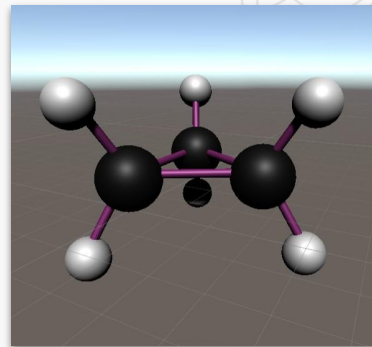
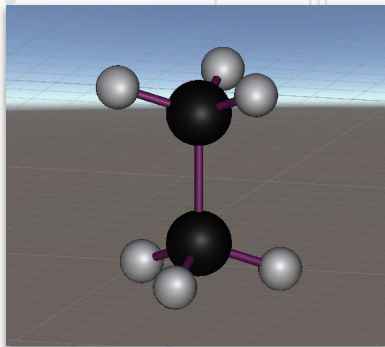
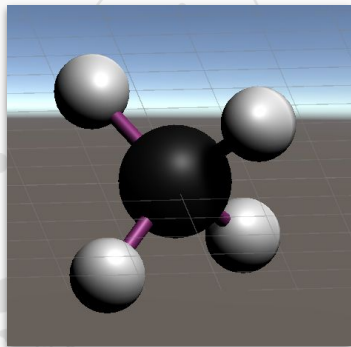
- Build an App
- Build 3D molecules
- Design markers (target images)
- Print the markers
- Use the App to detect the markers to show the 3D molecules



02 Project scope

3D Molecules

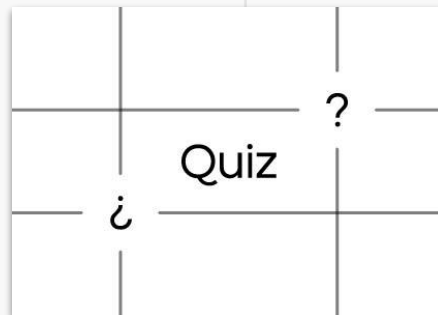
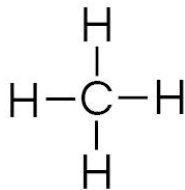
- Realistic! → Used proportions, right angles & official coloring of the molecules/atoms
- Colored the connectors to make them visually more attractive
- Build in Unity3D



02 Project scope

Markers

- Image targets for the 3D molecules
- Two types
 - To learn molecules: sum formula and valence formula (two markers for one molecule)
 - To play the quiz: special quiz-marker (one marker for all molecules)



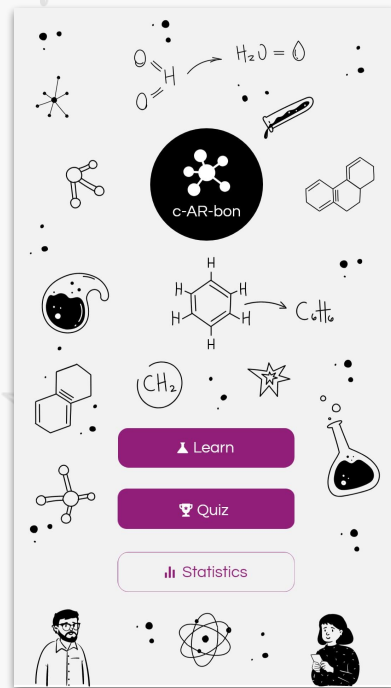
02 Project scope

App

UI Design:

Balance between elegant & playful design

- Background with hand-drawn symbols
- Clear, modern font
- Icons
- Not too colorful → one primary color



02 Project scope

App - features

Main scene:

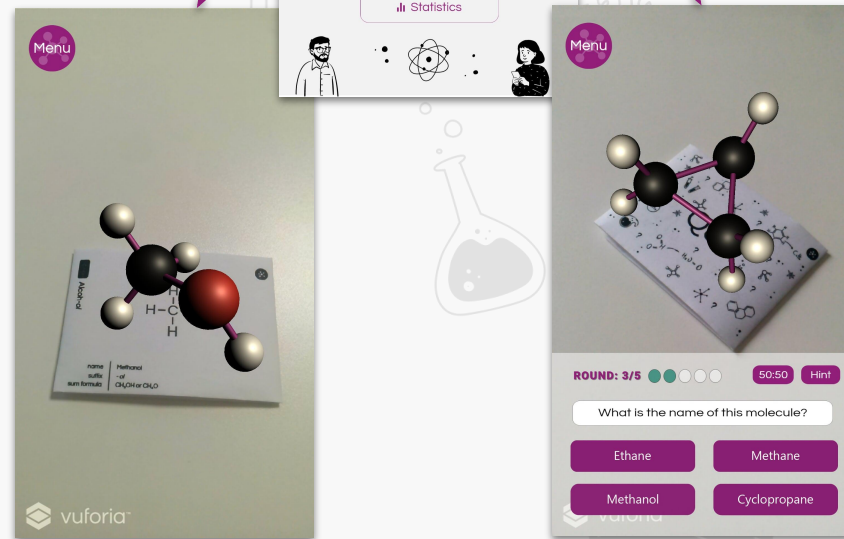
- Main menu → leads to learn-scene & quiz-scene

Learn scene:

- Detect image targets and show 3D model of molecule to interact → interactive flash cards
- Rotate, zoom in/out using spread/pinch gesture

Quiz scene:

- User has to find out which molecule is shown (using the quiz card)
- Several random rounds
- End result: counts right answers



03 Implements Requirements

Software:

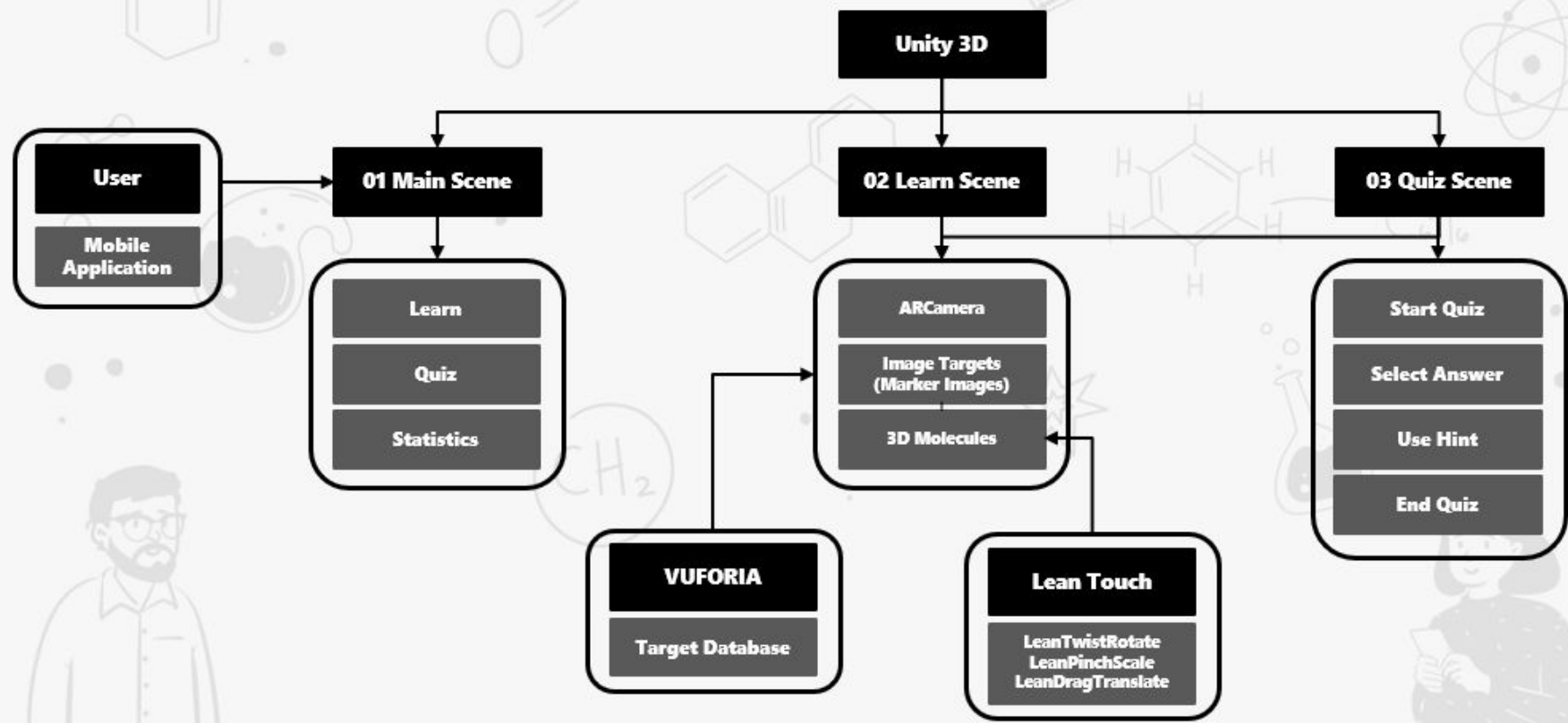
- **Unity3D:** To develop an AR application, For 3D molecule modeling
- **Vuforia:** To use image recognition
- **Adobe InDesign:** To design Markers (Image Targets)
- **Adobe XD:** To design the layout and components (Logo, Background, Buttons, ...)

Hardware:

- Smartphone/Tablet to run the app



03 Implements Application architecture

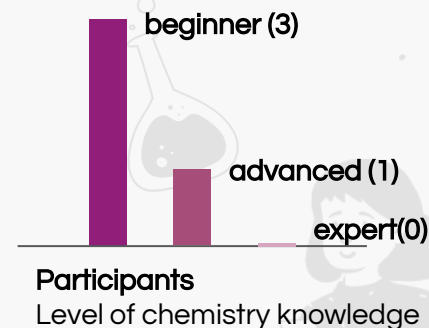
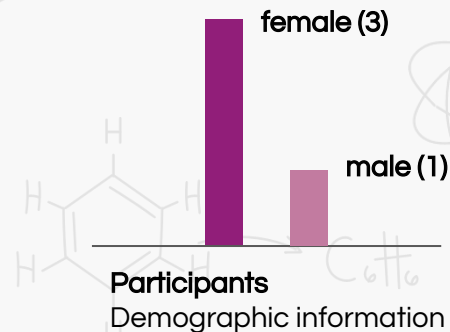


04 Usability Test

Result of usability test

Suggestions for improvement

- **Learn Scene**
 - more information about the molecules (e.g. name, formula, functional group, reactions...)
 - show chemical reactions
- **Quiz Scene**
 - clearer feedback whether the answer was correct/wrong
 - add levels/jokers/hint(50:50)
- **Markers**
 - improvement of the image recognition



04 Usability Test

Result of usability test

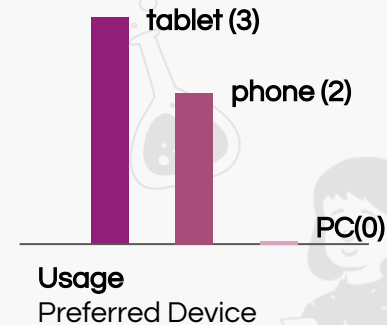
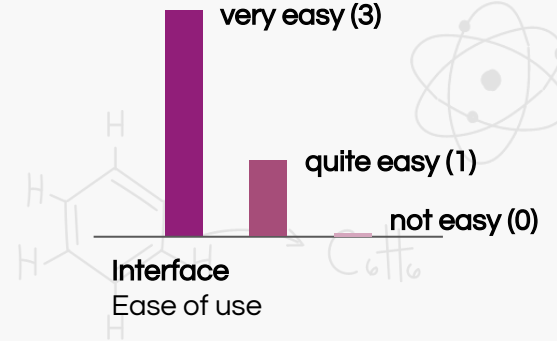
Suggestions for improvement

- **User Interface**

- buttons/text on buttons are not in the center
(-> due to the icons)
- home/menu button can be misinterpreted as logo symbol

- **Features & Functionality**

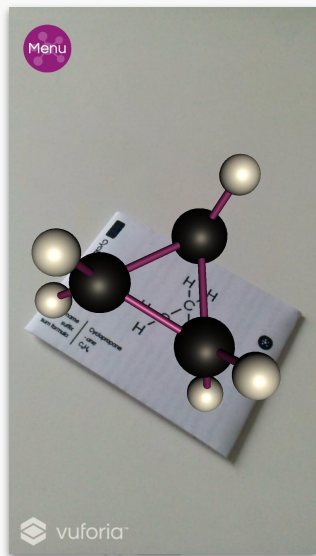
- add statistics -> users are able to check how good they were
- add zoom in/out - function



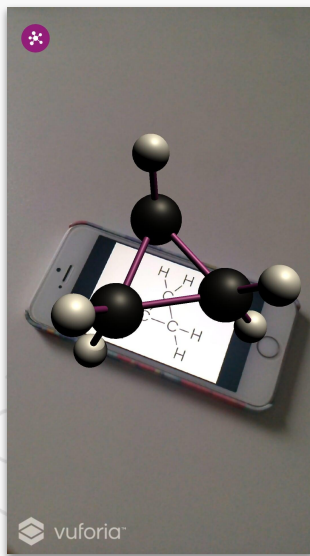
04 Usability Test

We improved the User Interface

New menu button and responsive design



Improved
menu button



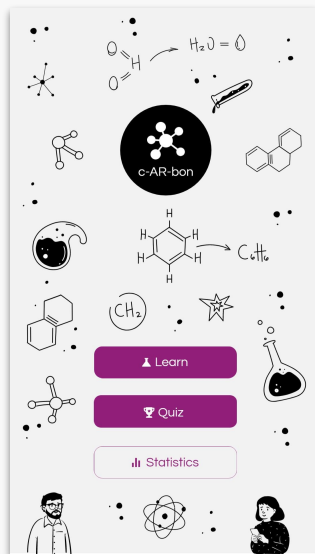
Before
menu button



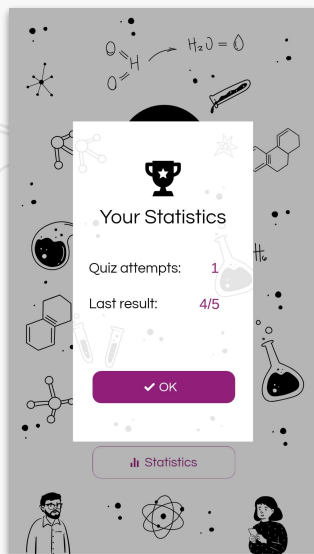
04 Usability Test

We improved the functionality

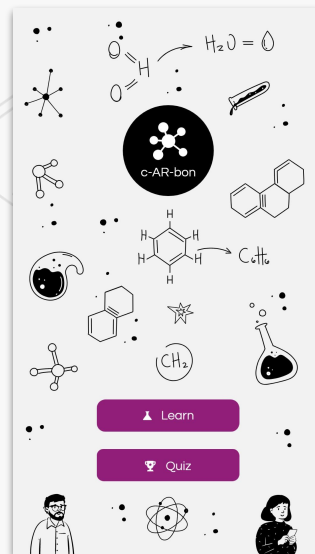
New function: statistics



Improved
home screen



Improved
statistics overlay

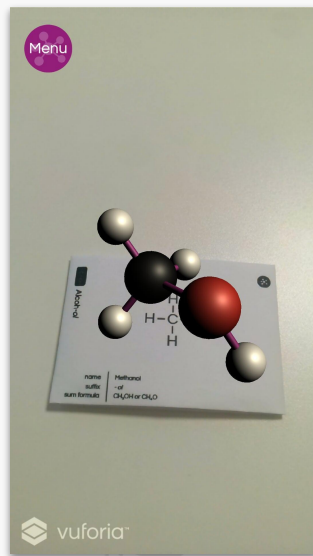


Before
home screen

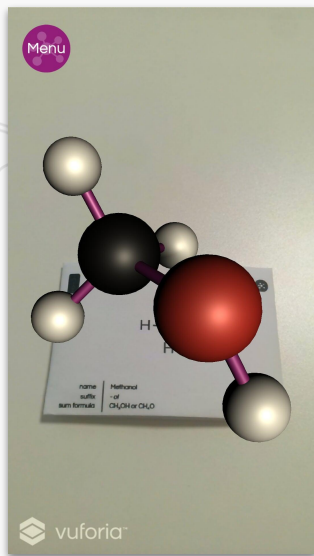
04 Usability Test

We improved the functionality

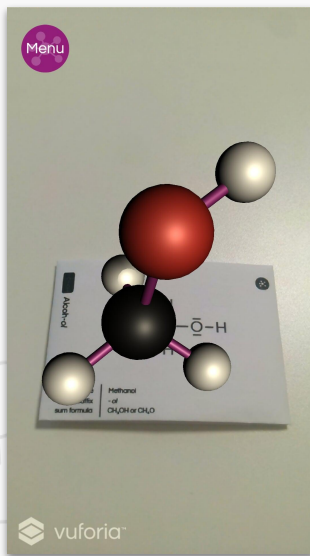
New function: zoom, rotate



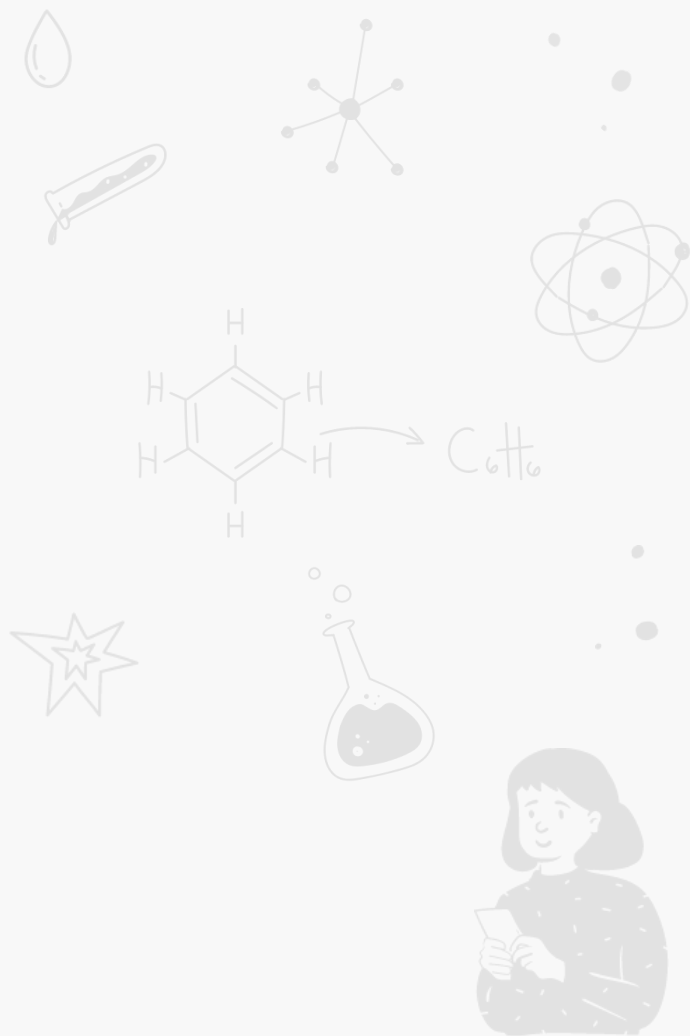
Improved
normal



Improved
zoom-in



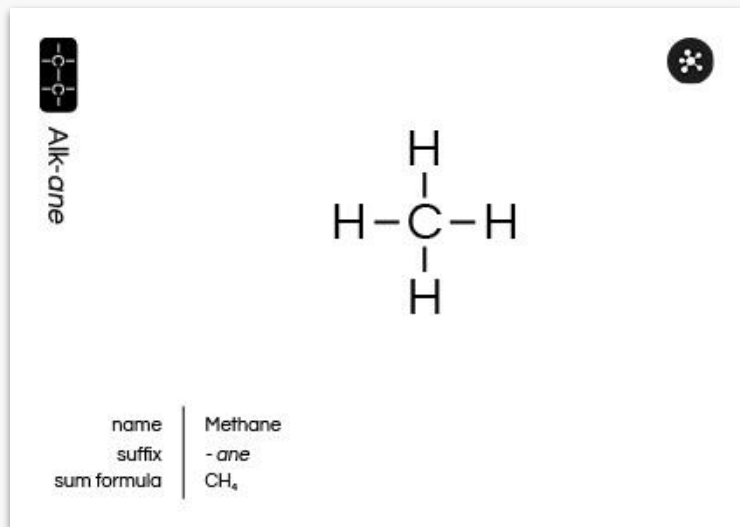
Improved
rotate



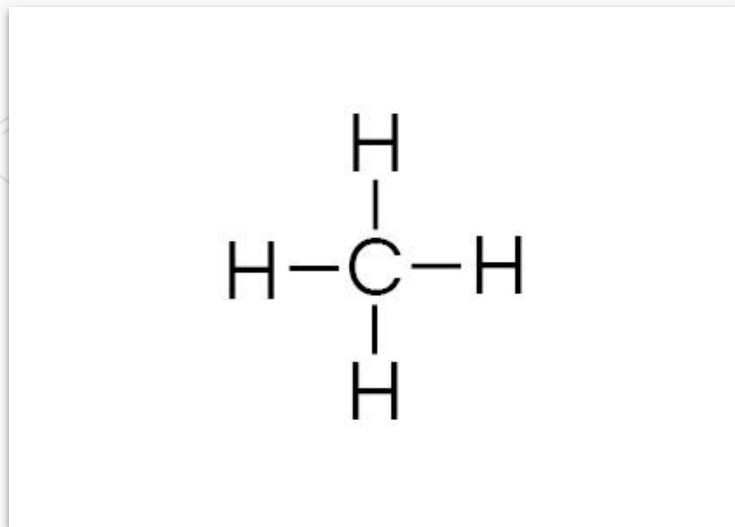
04 Usability Test

We improved the markers

New design: better differentiation and more information



Improved
marker for methane



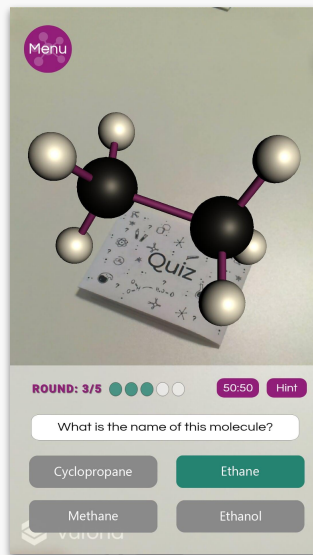
Before
marker for methane



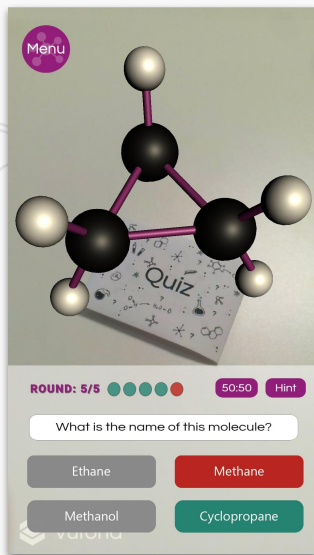
04 Usability Test

We improved the quiz scene

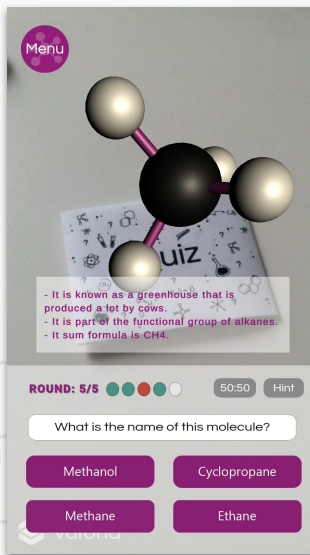
New features and UI redesign



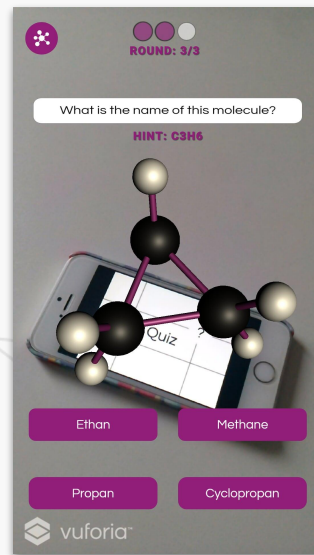
Improved
feedback for
correct answer



Improved
feedback for
wrong answer



Improved
new features
hint & 50:50 Joker

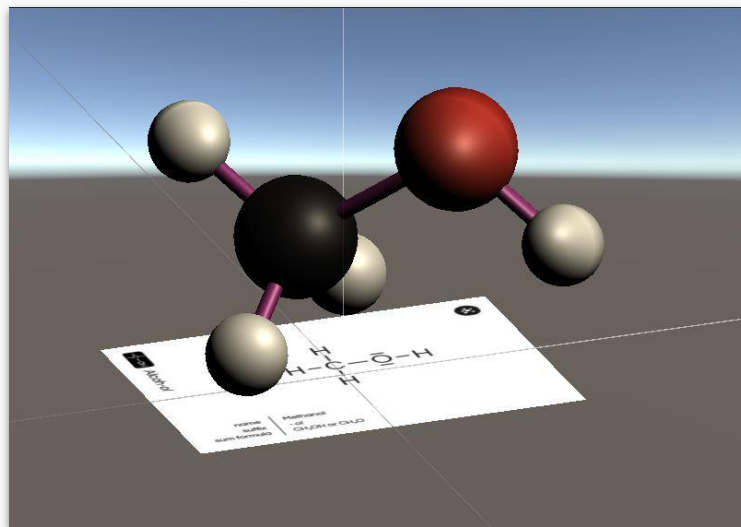


Before
unclear feedback

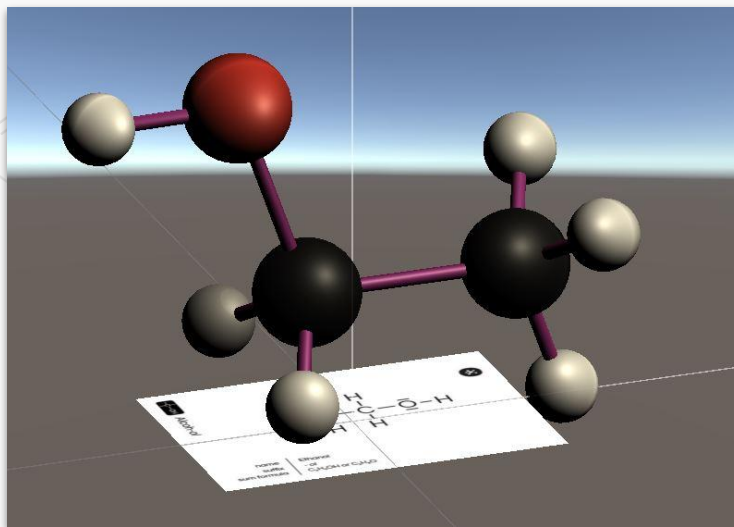
04 Usability Test

We improved the content

Two more molecules



Improved
new molecule methanol



Improved
new molecule ethanol

05 Lesson learned

User Tests

- even with only few test persons it is possible to spot errors and weak points

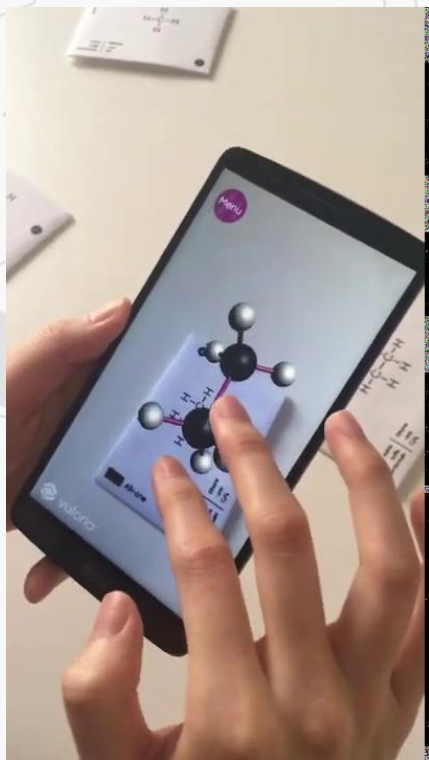
Image Targets

- differentiation of the Image Targets can be easily achieved with a symbol that varies its position

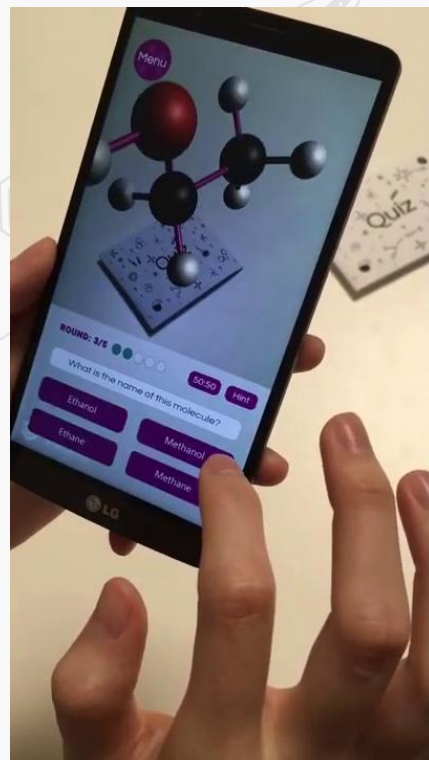
Unity

- building simple objects in Unity works very well, but as soon as they get more complex a different software might be more appropriate
- working with prefabs and empty game objects is very useful
- new UI builder feature could be a handy function, but is still in the beta version

06 Demo video



[Learn scene]



[Quiz scene]