SERIOUS GAMES FOR LOW ENERGY BUILDING CONSTRUCTION WORKER TRAINING

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AIMS & OBJECTIVES

- Identify the effectiveness of serious games for construction workers.
- Compare the serious gaming approach to more traditional approaches.
- Explore opportunities /potential of serious games for teaching construction workers low energy training.

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RESEARCH QUESTIONS

A) To what extent can upskilling training be delivered through the use of serious games rather than with traditional methods?

B) To what extent can attitudinal change take place through the use of serious games?

FES & QUALIBUILD

Build UP Skills Ireland Project (BUSI) undertook a skills gap analysis in relation to implementation of low energy buildings.

Wheel of Key Words for Quality

Key conclusions:

- Visible knowledge gap apposed to skills gap.

- Need for attitudinal change in the Irish construction industry.

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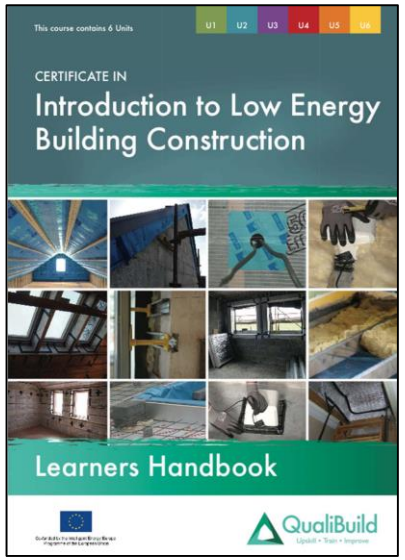
QUALIBUILD LEARNING OUTCOMES

1. List and identify common areas of air leakage
2. Principles of air tight & wind tight construction
3. Importance of air-tightness and wind-tightness



Qualibuild Learners Handbook

Unit 1: Energy and Buildings
- Energy Use in Buildings
- Key Terms
- Overview of Climate Change & EU Policy

Unit 2: How Energy Works
- Heat Transfer
- Simple Explanation of Energy Units
- Energy Principles of Building

Unit 3: Building Fabric 1
- Air Tightness & Wind Tightness

Unit 4: Building Fabric 2
- Insulation, Thermal Bridging & Best Practice

Unit 5: Heating & Ventilation
- Heating Systems
- Ventilation & Condensation

Unit 6: Systems Thinking
- Working Together
- The Importance of Communication

Course structure and layout

WHAT ARE SERIOUS GAMES?

- Computer and video games that entertain users while achieving primary goals of education and training.

- Similar to educational games focused on audience outside of primary & secondary education.

Ioannis Th. Paraskevopoulos (2014)

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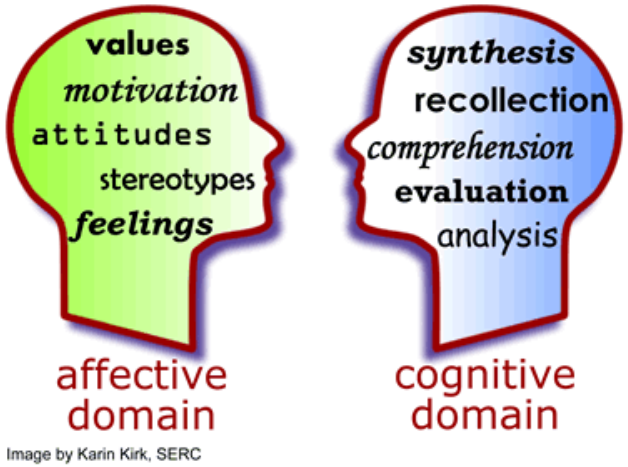
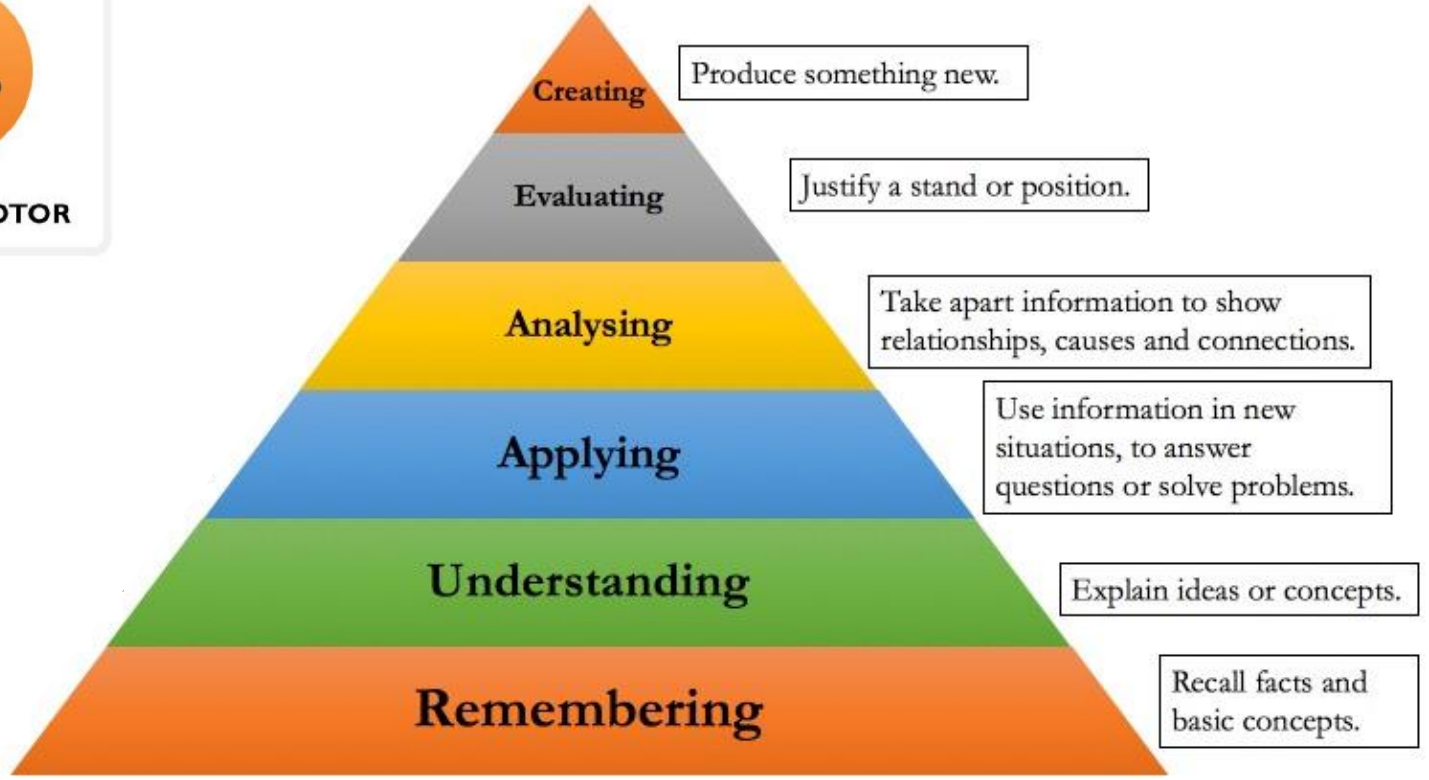
3 DOMAINS OF LEARNING

Larson, Miriam B, and Barbara B Lockee (2014)





Gershon, M. (2015)

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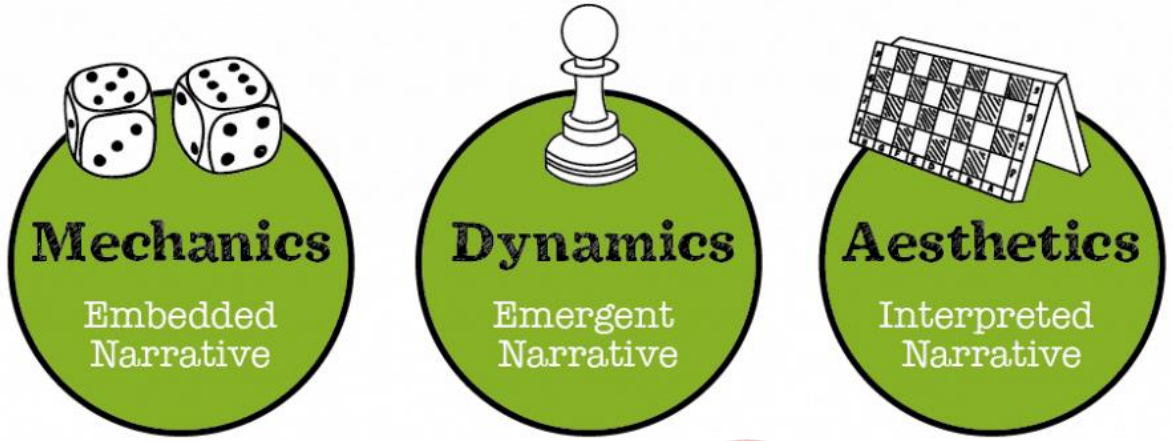
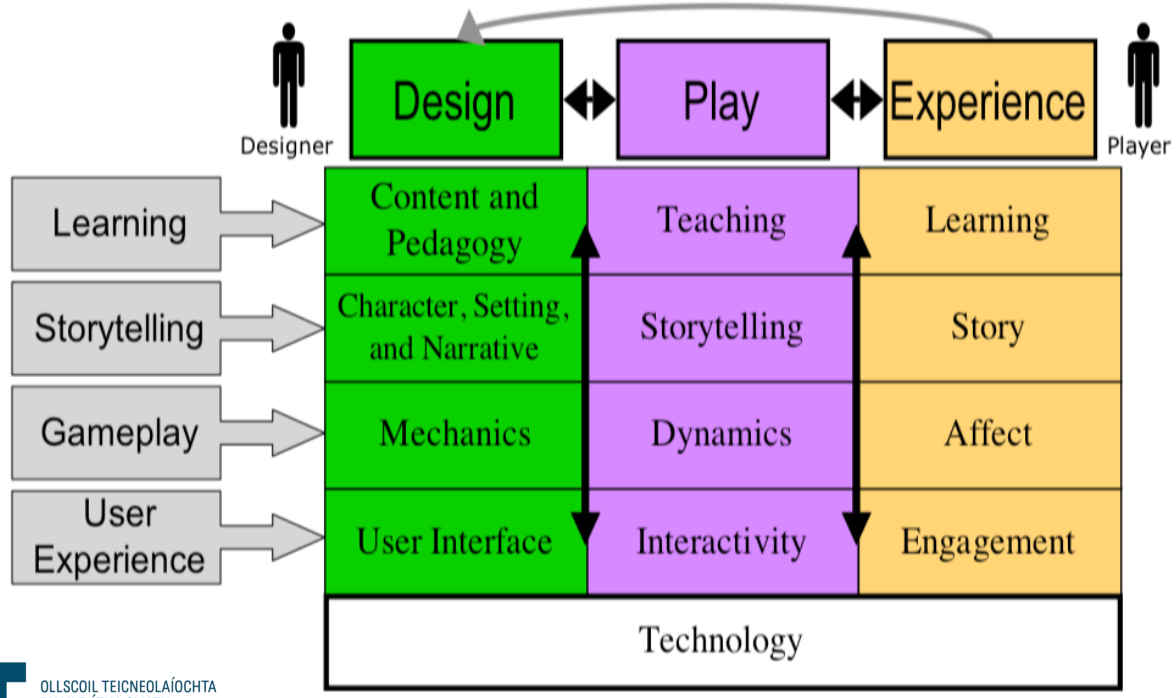
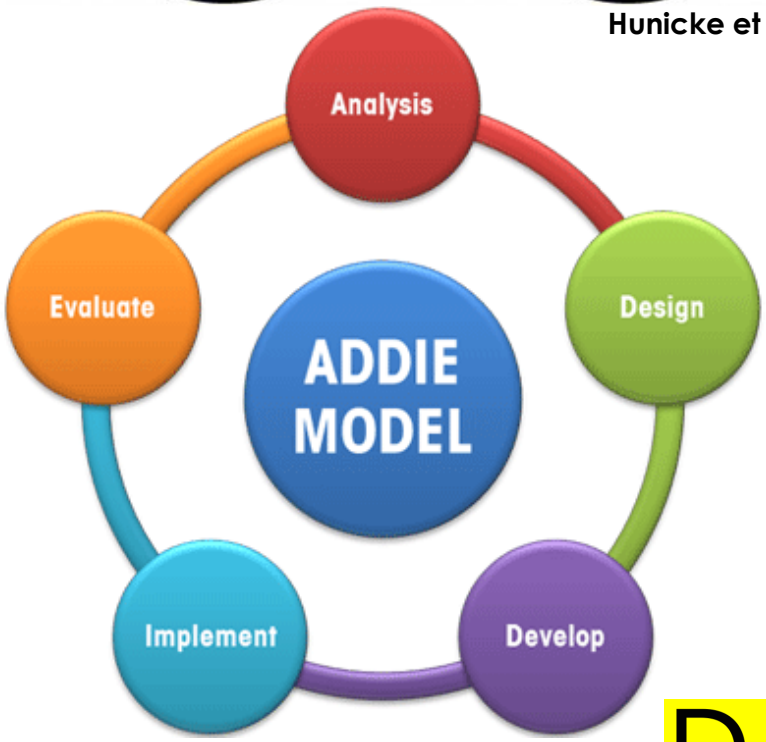
FRAMEWORKS & METHODOLOGIES



Hunicke et al (2004).



Winn, (2008)



Bichelmeyer, B. (2005).

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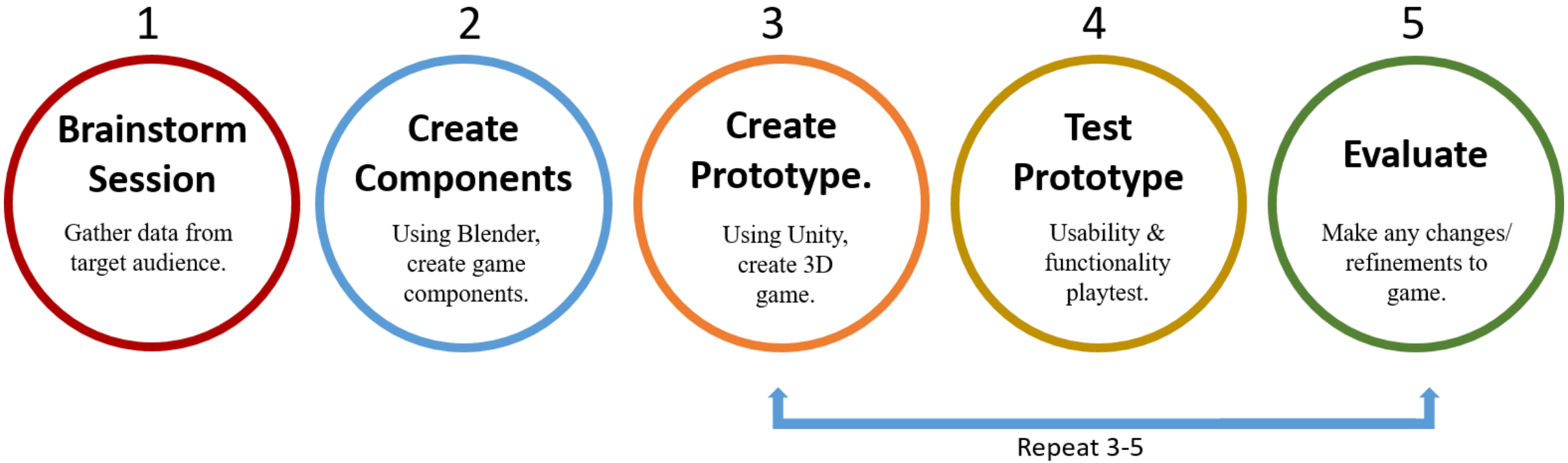
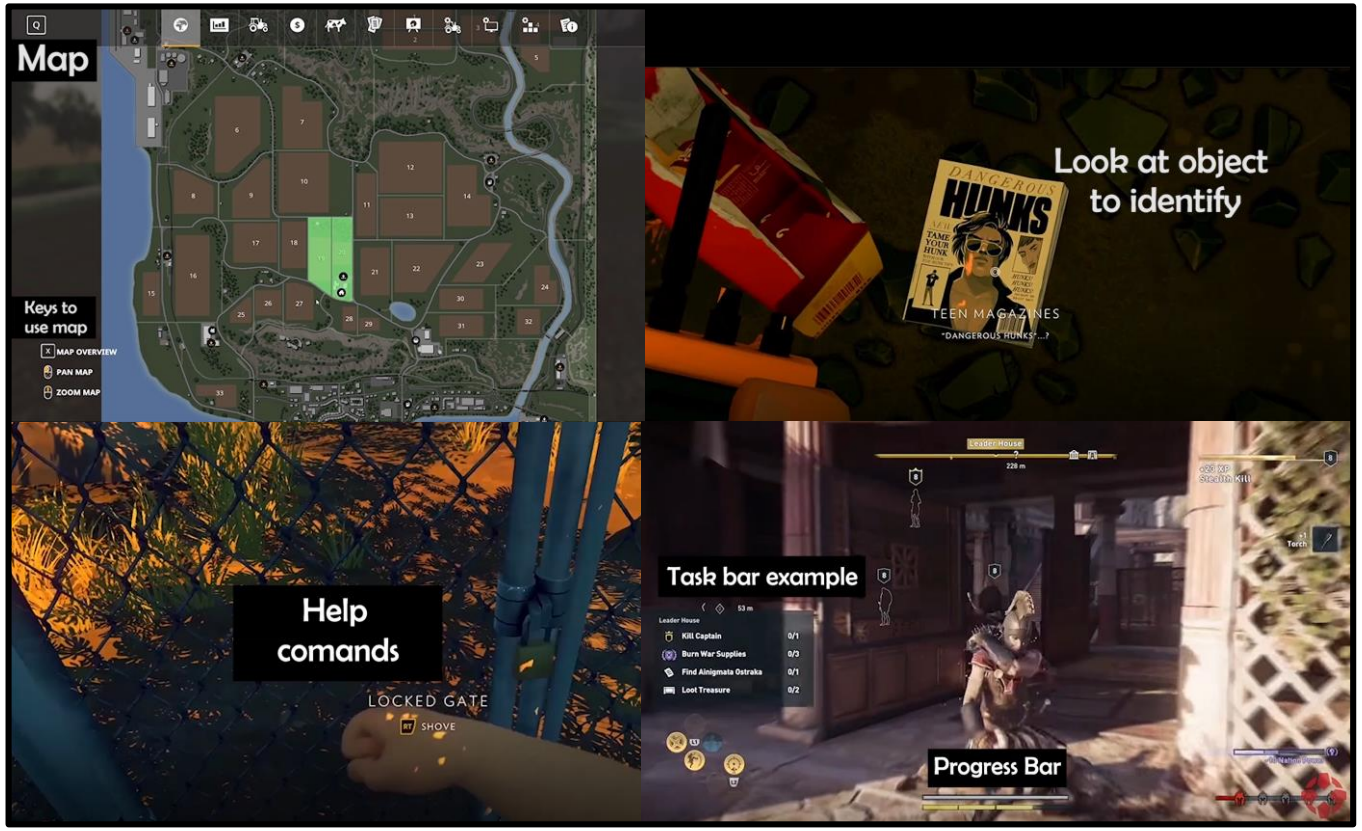
METHODOLOGY



BRAINSTORMING SESSION JAN ’19 - RESULTS

Areas, concepts and skills that construction workers struggle most with are as follows;

- Continuity of insulation
- The effects of badly installed insulation
- Thermal bridging / effective airtightness
- Systems thinking
- Unit 3 of the QualiBuild Foundation Energy Skills Training Handbook.



Example Games

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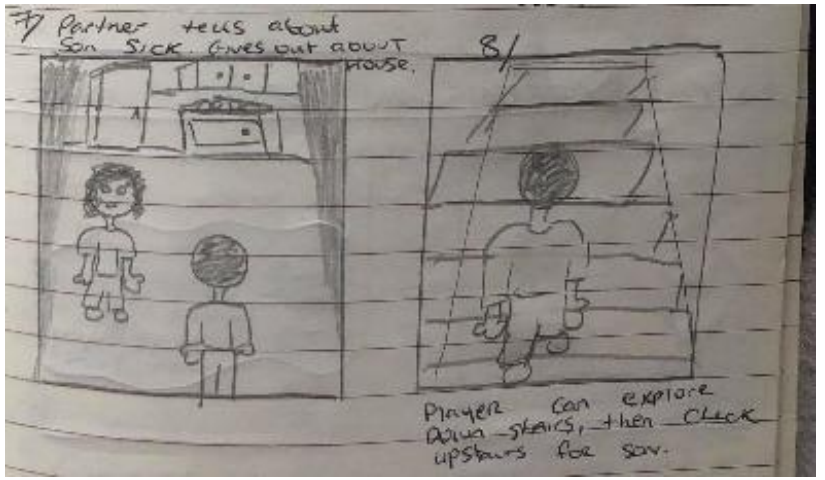
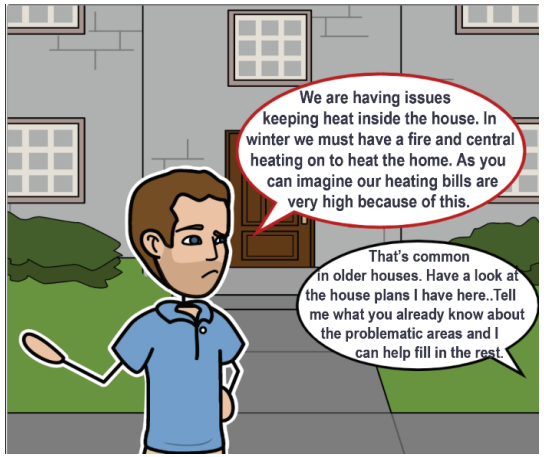
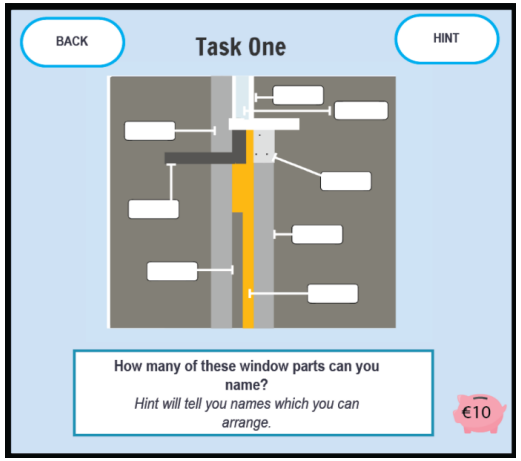
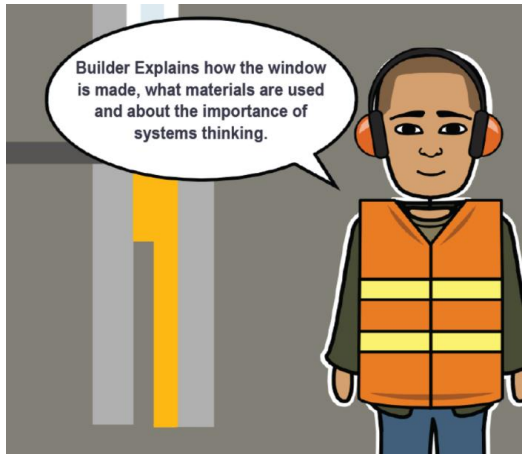
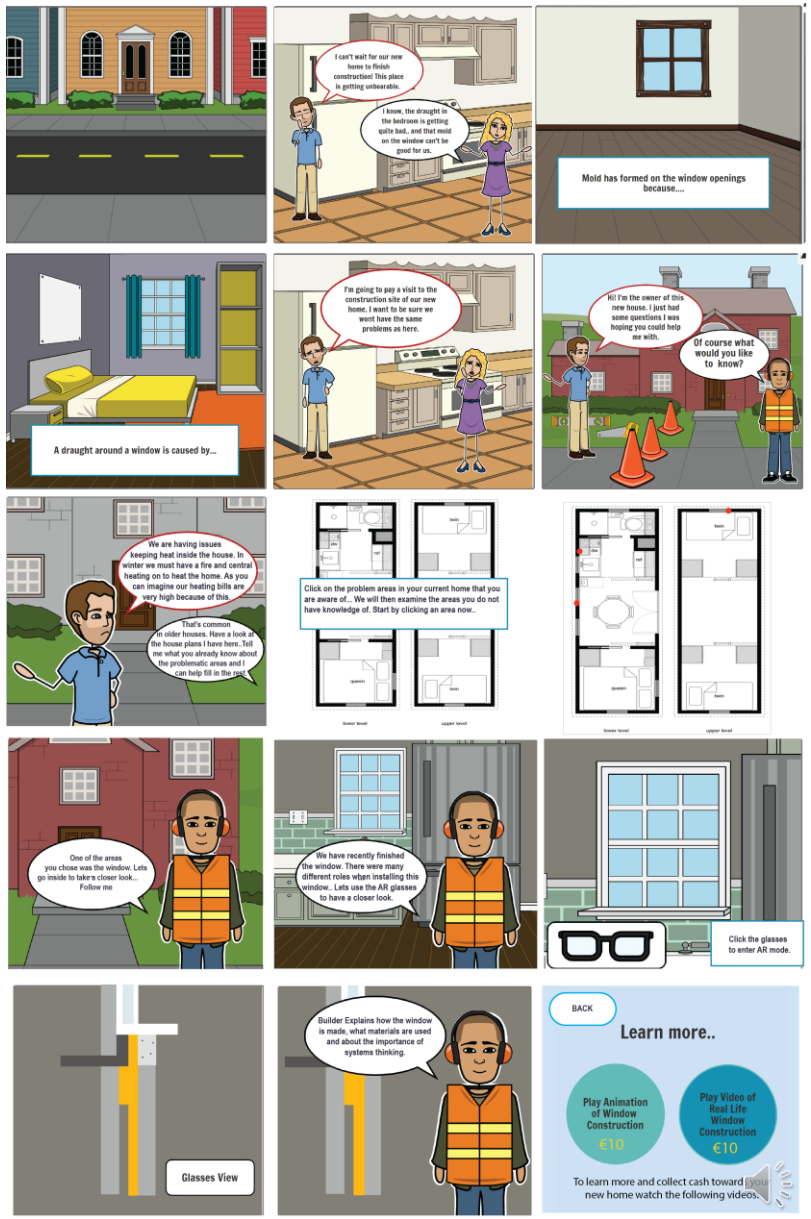
STORYBOARDING



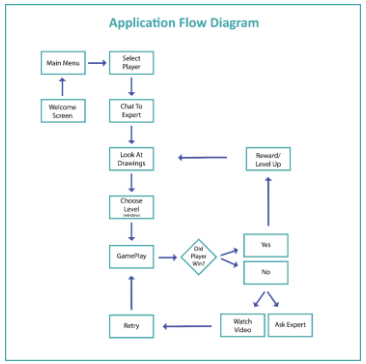


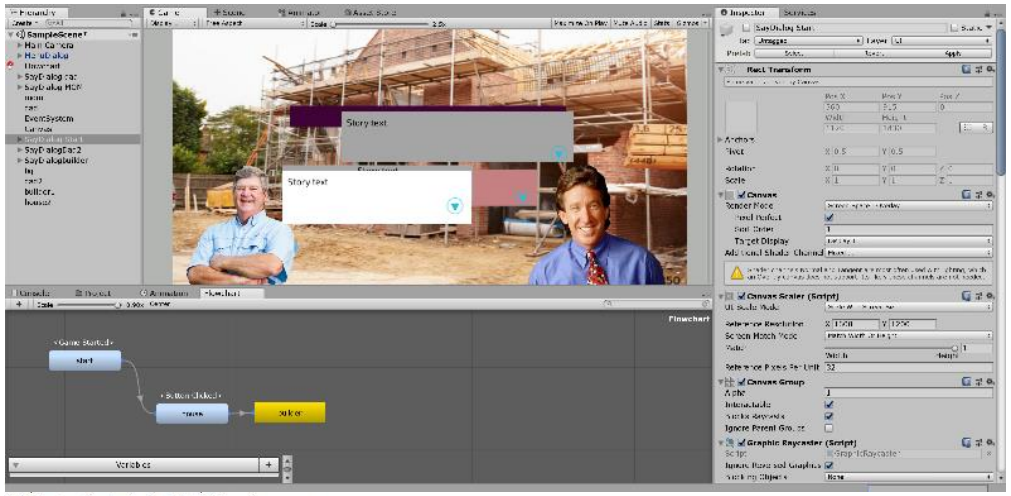




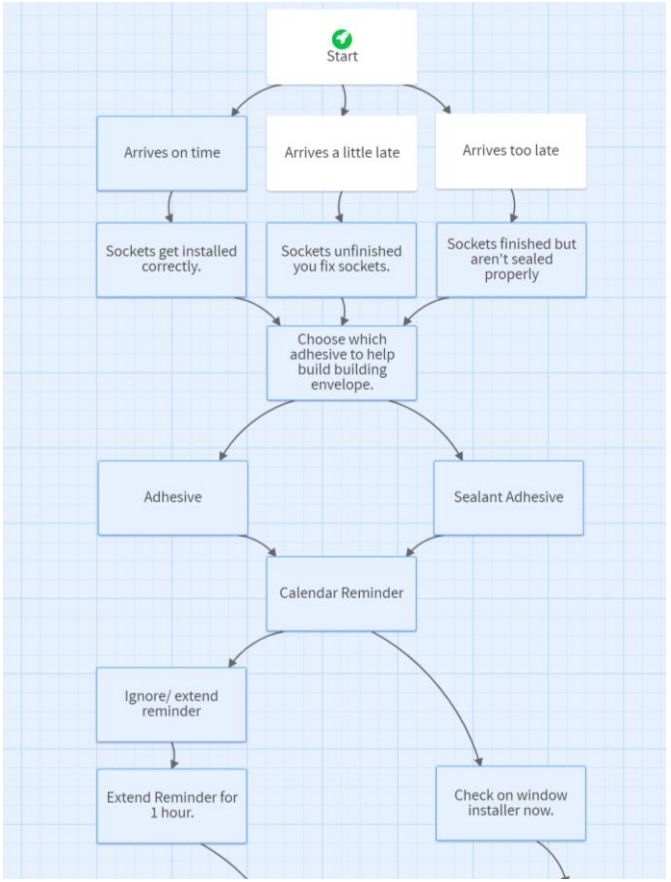


PROTOTYPING TOOLS

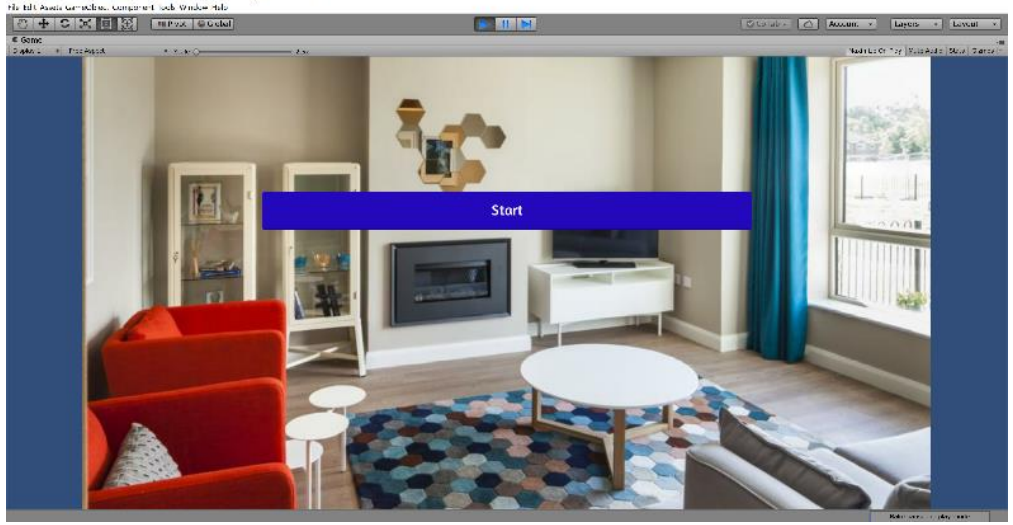




Drawio



Twine



Fungus

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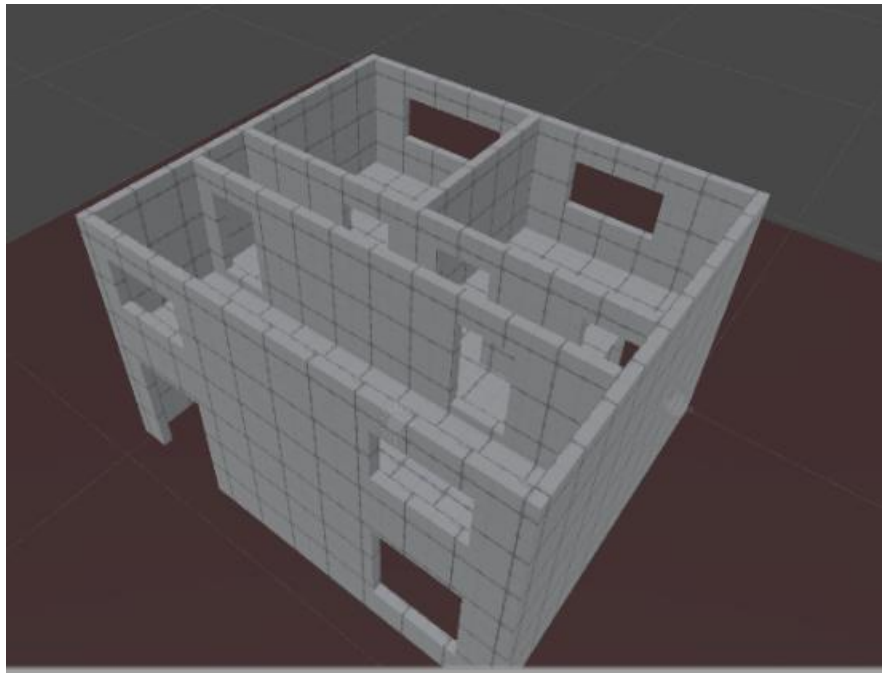
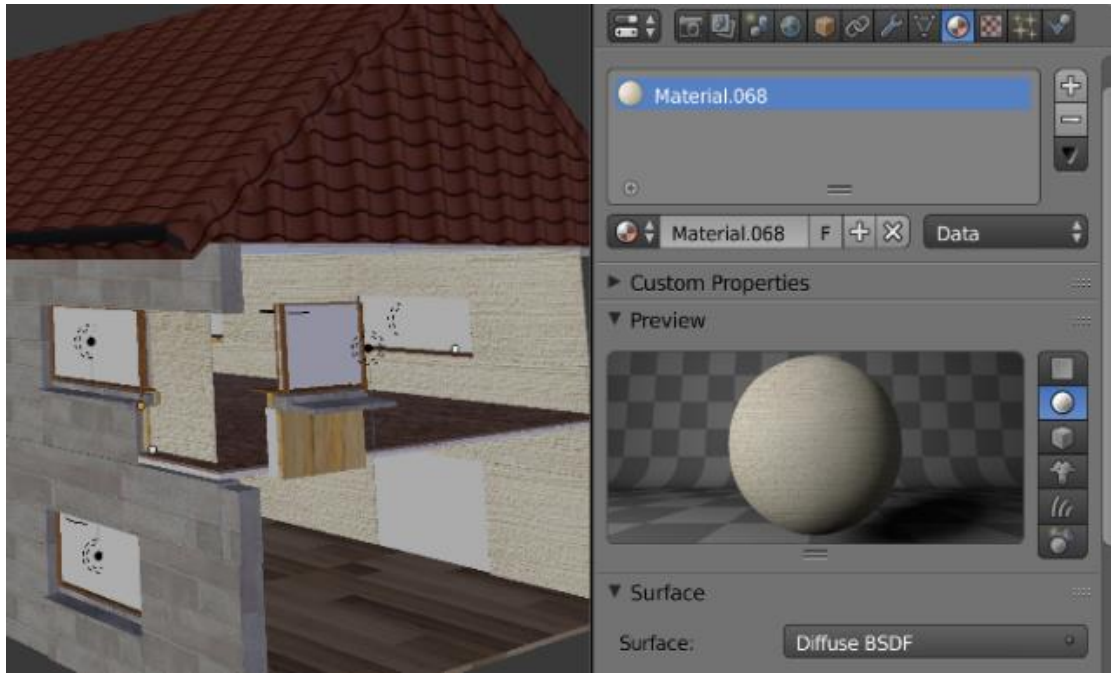
PROTOTYPE DEVELOPMENT

PROBUILDER
SEAMLESS LEVEL DESIGN



blender



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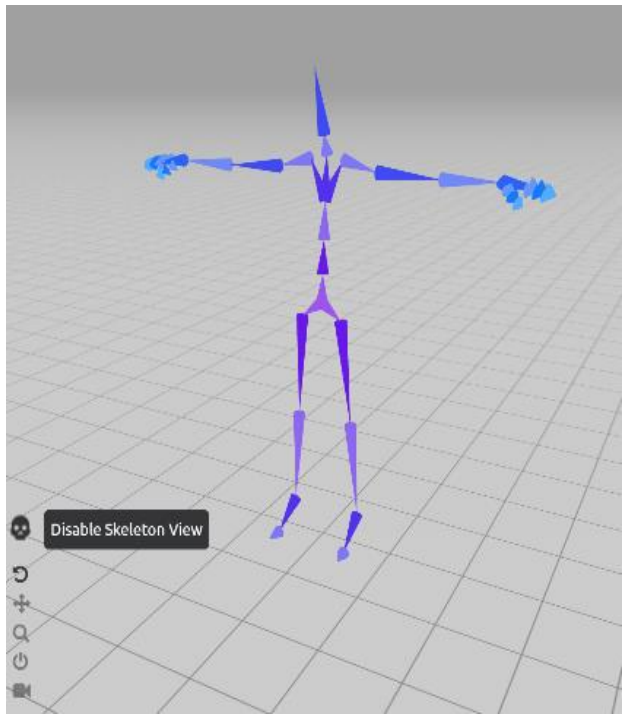
CHARACTERS



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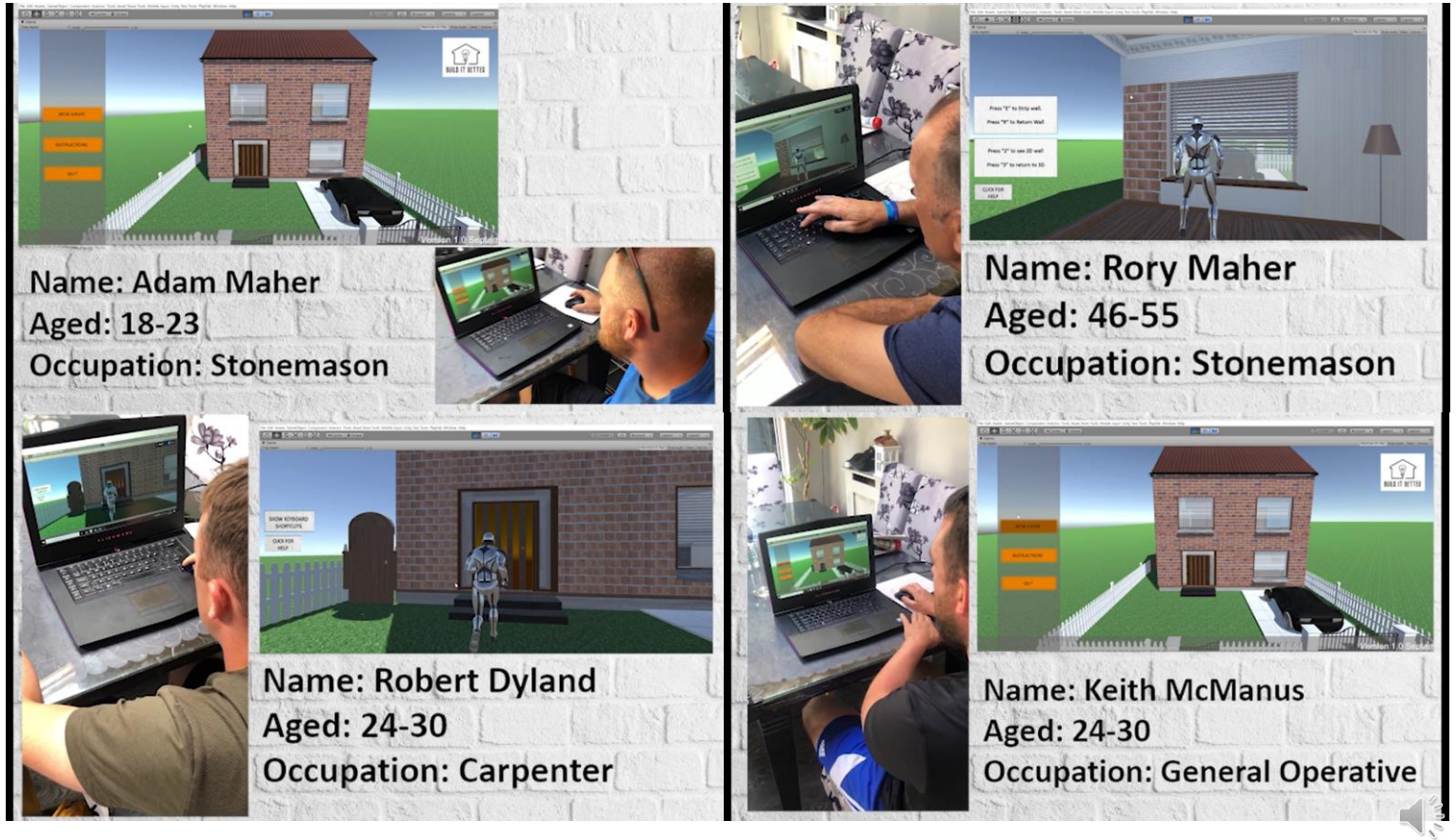
USER-TESTING 1
USABILITY & FUNCTIONALITY

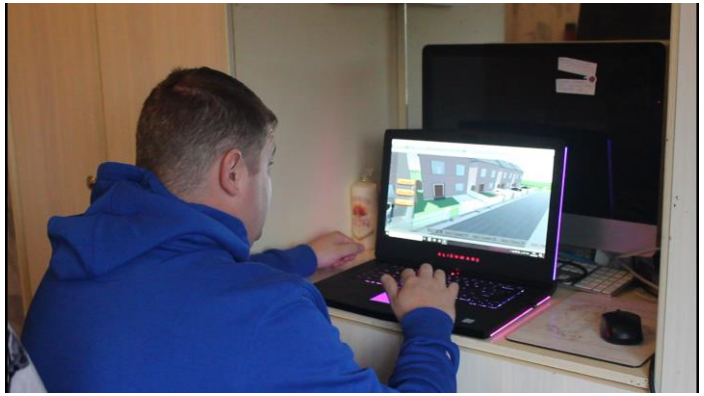
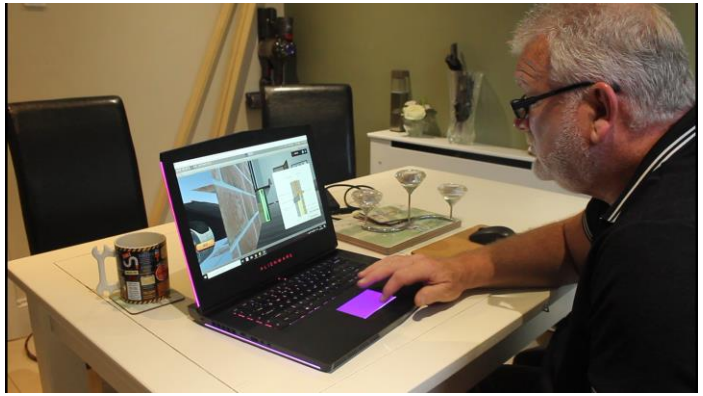
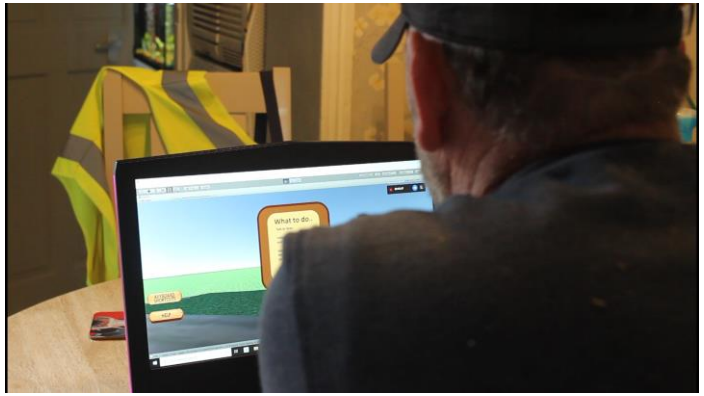
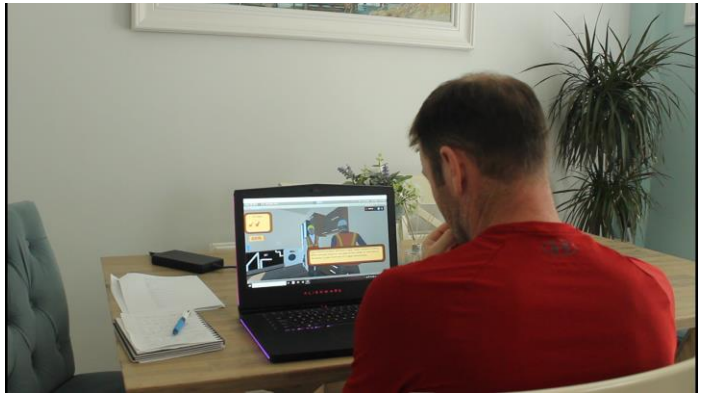
Data Collected:
10 Participants
10 Surveys
10 Interviews

The results indicated that majority of participants in the usability testing session:

- Rarely looked at the instructions before, or even during gameplay.
- For the most part, listened and read along with the information being given to them by the pop-up builder.
- Realised after the first level that the information being taught to them, abled them to complete the task and move onto the next.
- Agreed and empathised with the ‘family characters’ located around the home.



FINAL TESTING

Data Collected:
20 Participants
40 Surveys
10 Exit-Interviews
Gameplay data collection application

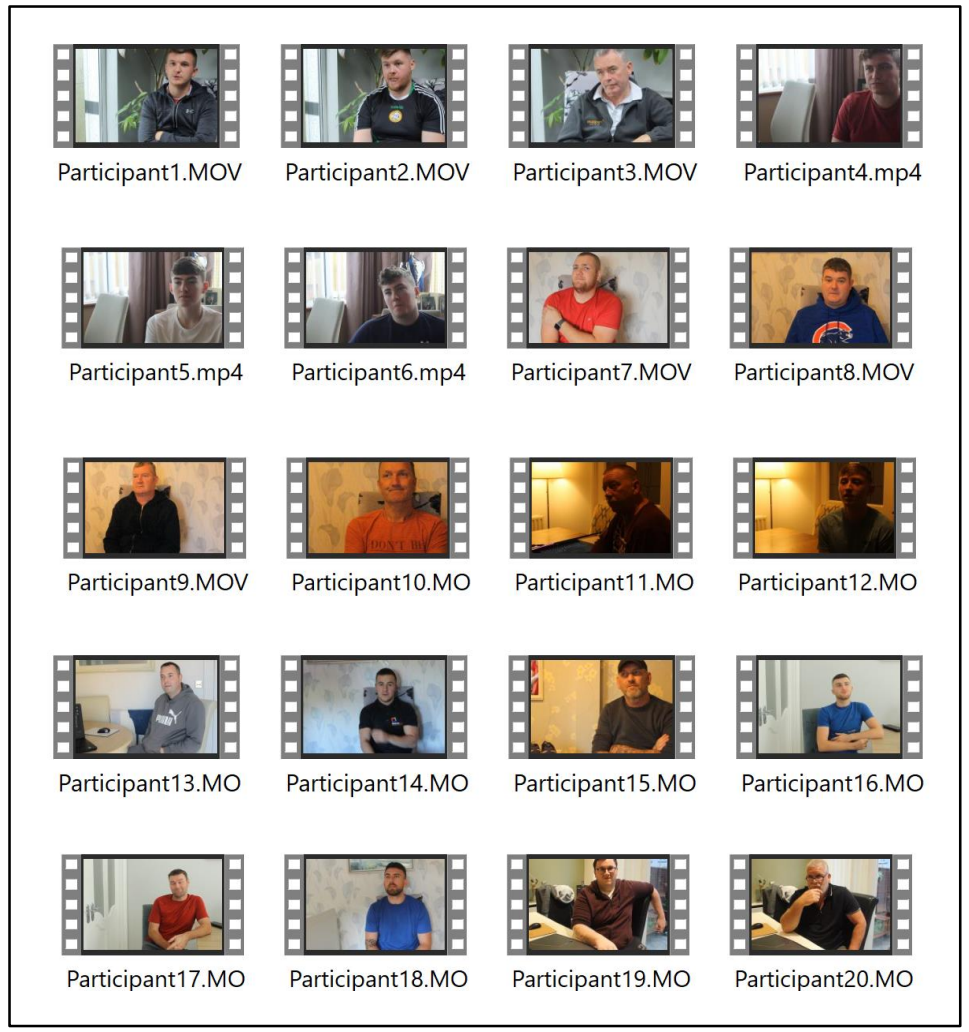
The results indicated that majority of participants in the final testing session:

- Felt comfortable using the serious game.
- Felt they learned something from the game.
- Felt they enjoyed using the game to learn over traditional methods.
- Encouraged this new method of training construction workers.
- Encored attitudinal change regarding systems thinking and working with other trades.

DATA COLLECTION

Log index

Id	Timestamp	UserId	Scene	Message	actions
1793	2020-08-24 18:08:08	5	Level2Sittingroom_LM	Pressed Done talking to granny button, Scene 1	show edit Delete
1794	2020-08-24 18:08:52	5	Level2Sittingroom_LM	ok button, level 2, Instructions2, sittingroom	show edit Delete
1795	2020-08-24 18:09:02	5	Level3Cavity1_newTest	Talk to Cavity Builder Button	show edit Delete
1796	2020-08-24 18:09:43	5	Level3Cavity1_newTest	Pressed Done talking to Cavity Builder button, Scene 3	show edit Delete
1797	2020-08-24 18:10:20	5	Level3Cavity1_newTest	Pressed Done talking to Cavity Builder button, Scene 3	show edit Delete
1798	2020-08-24 18:11:20	5	Level3Cavity2_newTest	Cavity Fix option clicked	show edit Delete
1799	2020-08-24 18:11:27	5	Level3Cavity2_newTest	Fix with replace insulation option clicked	show edit Delete
1800	2020-08-24 18:11:34	5	Level3Cavity2_newTest	Chart done button clicked. Finished cavity level	show edit Delete



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ANSWERING RESEARCH QUESTION 1

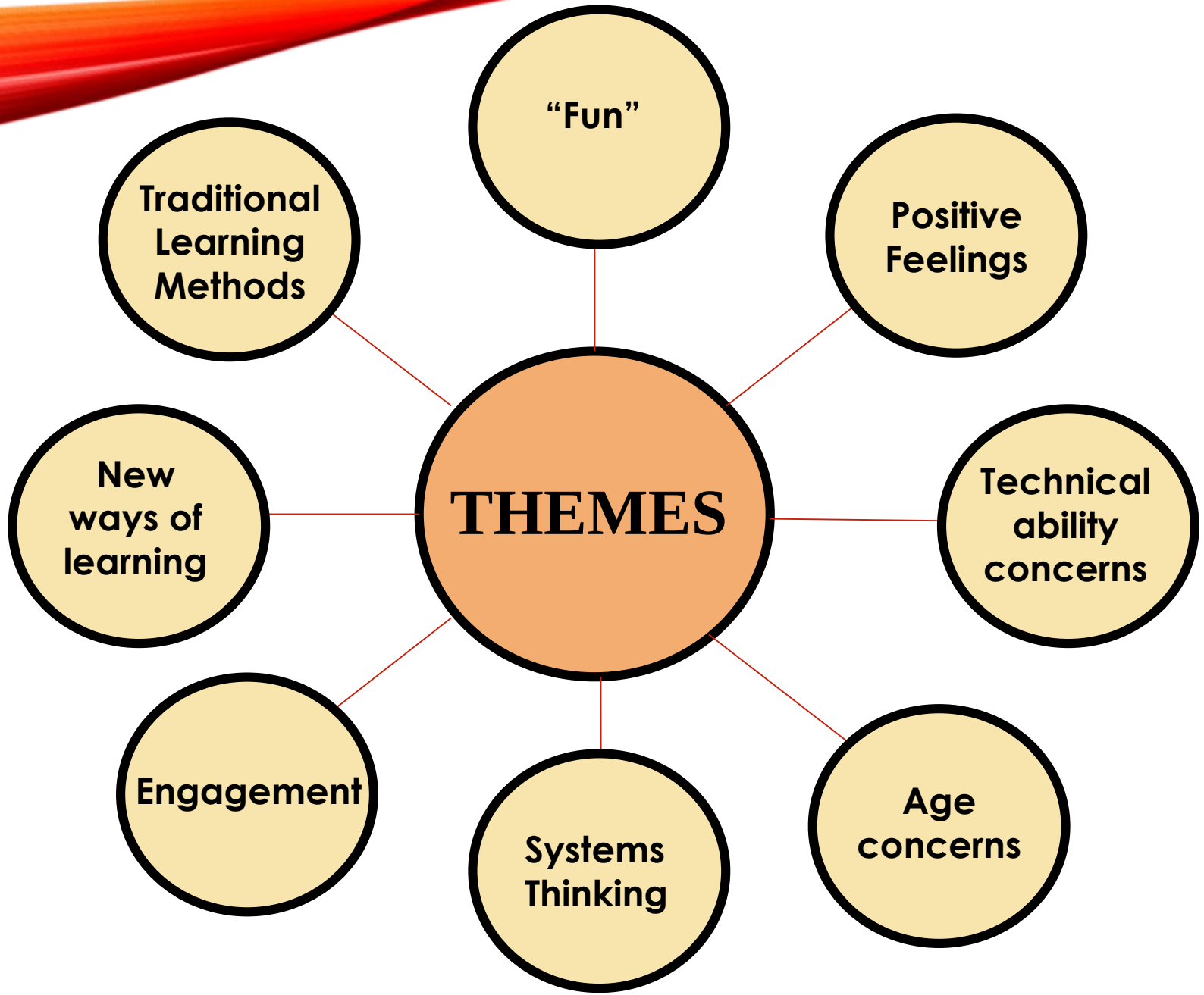
To what extent can upskilling training be delivered through the use of serious games rather than with traditional methods?

Research tools used to answer Research Question 1 were: the game, the questionnaires, and in-game data collection application and exit-interviews.

ANSWERING RESEARCH QUESTION 2

To what extent can attitudinal change take place through the use of serious games?

Research tools used to answer Research Question 2 were: the pre/post-game questionnaires, and exit-interviews.



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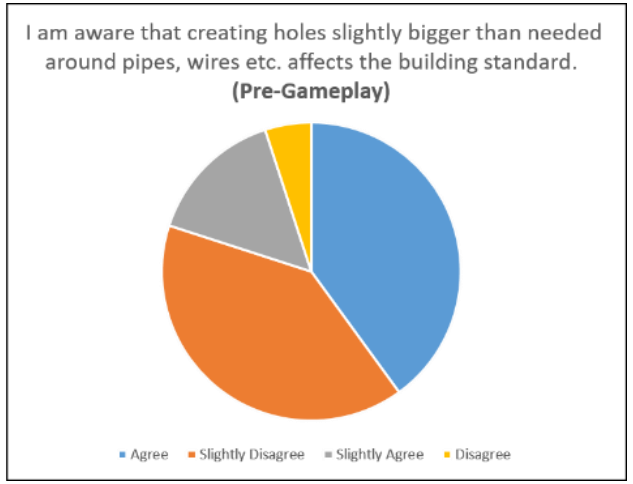
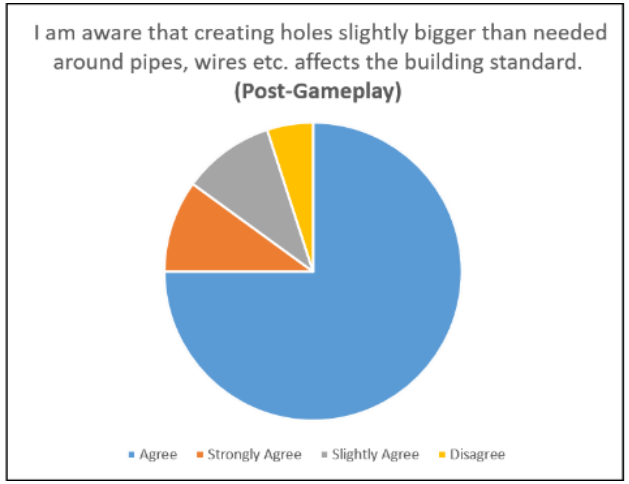
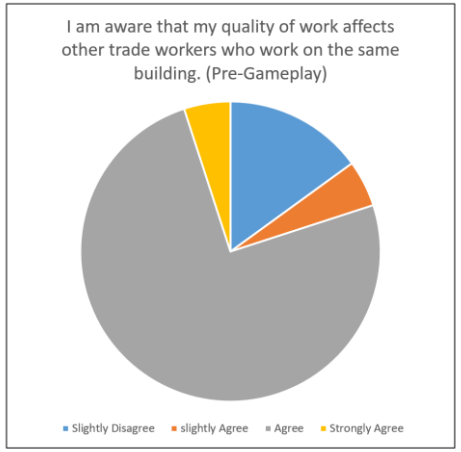
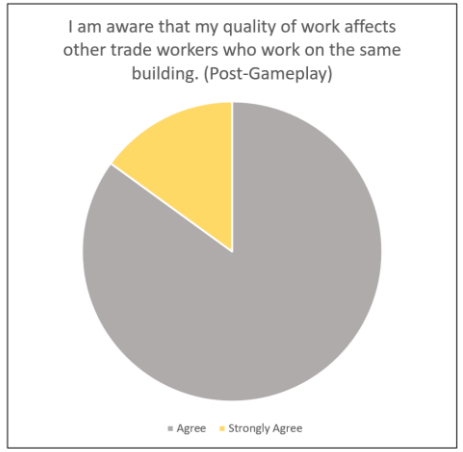
DATA ANALYSIS









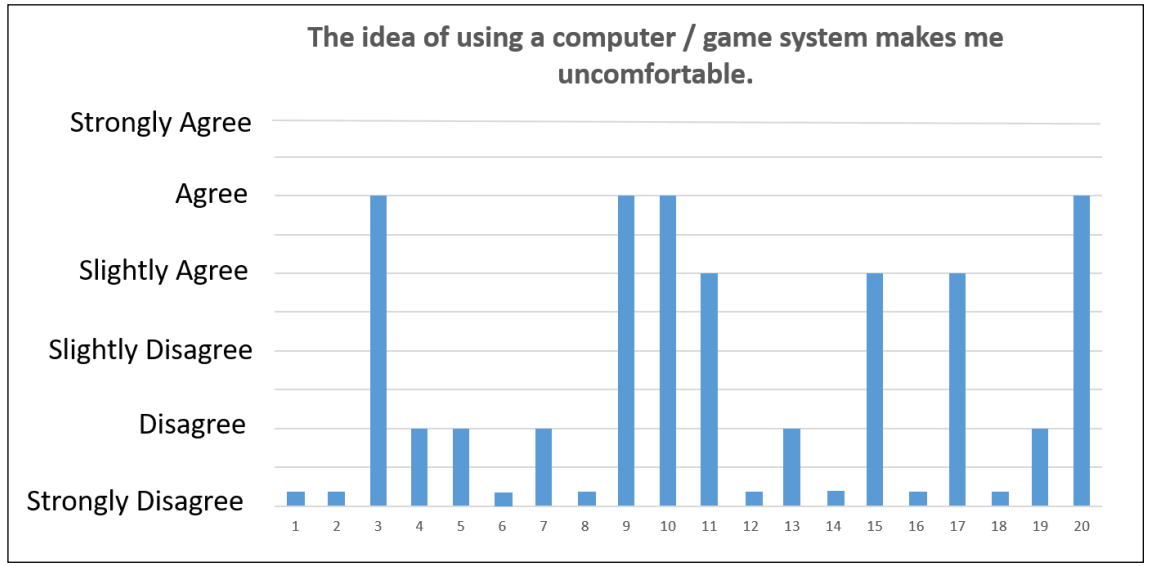
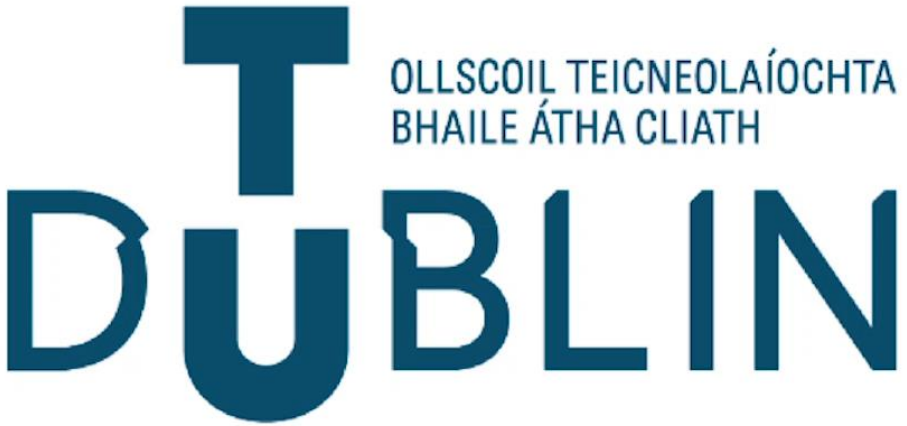


TABLE OF GAME COMPLETION TIMES

AGE	18-23	24-30	31-45	46-55	Over 55
	00:08:10	00:07:37	00:10:23	00:16:23	00:06:29
	00:10:29	00:12:12	00:08:44	00:09:20	00:11:40
	00:07:10	00:10:42	00:09:26	00:15:01	00:09:30
	00:09:52	00:15:53	00:10:37		00:09:06
	00:11:31				
AVERAGE	00:09:26	00:11:36	00:09:48	00:13:35	00:09:11

https://vimeo.com/472232867



PRESENTS

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