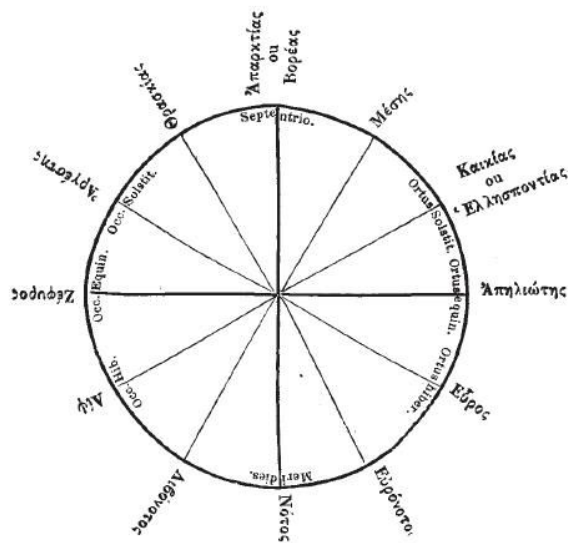
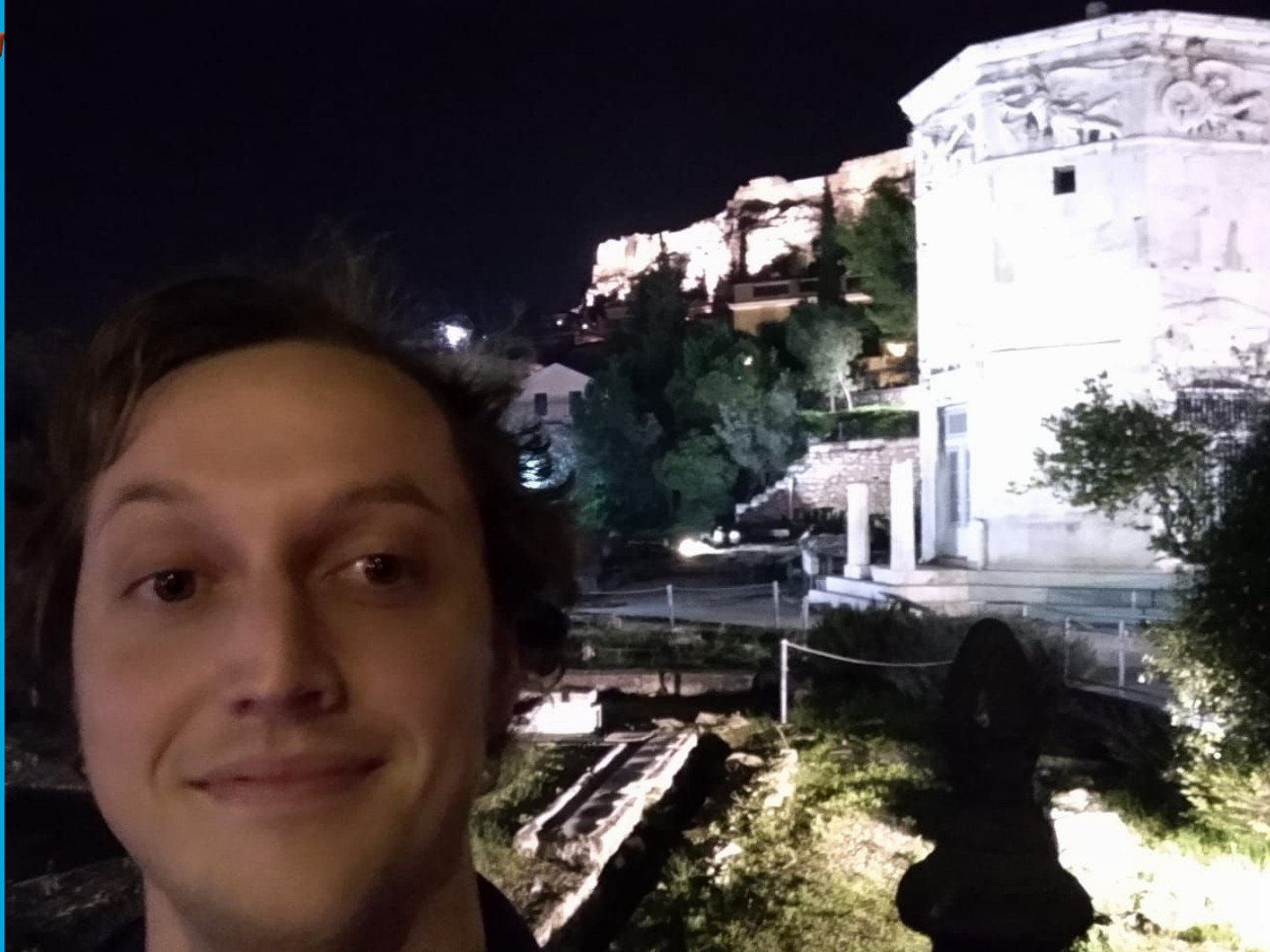


## Boreas



**HOT  
PIPE**



# HOT PIPE

Isaac	Garet	Ivan	Mia
HP 252	HP 248	HP 174	HP 142



Isaac is defending!  
Mia summons Boreas!



# Learning geothermal energy basics with the serious game HotPipe

A game by:

**Huinan Jiang**

**Mohammed Al Owayyed**

**Runar Ask Johannessen**

**Ronald van Driel**

**Liam Mac an Bhaird**

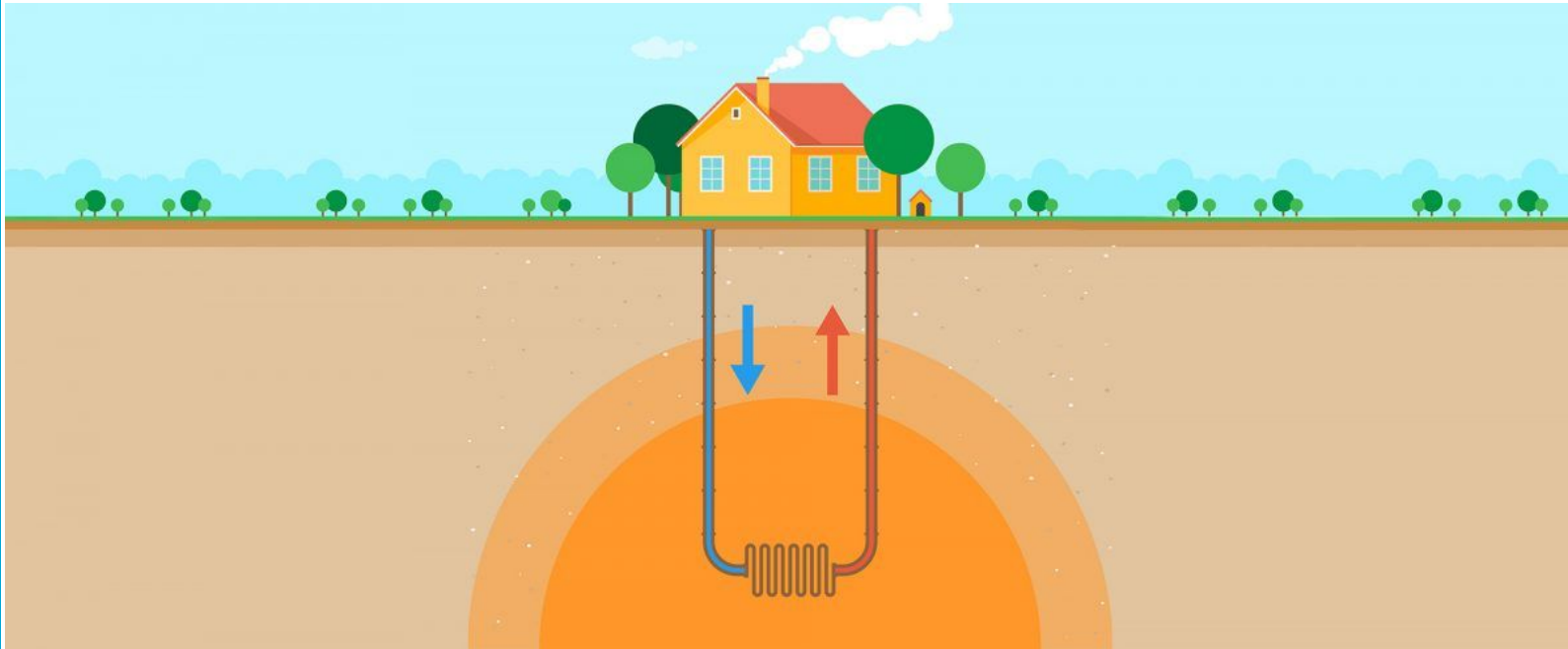
**Nestor Z. Salamon**

**J. Timothy Balint**

**Rafael Bidarra**

Convey the basic concepts of a geothermal system to the players

## What is a geothermal system?



## Main geothermal concepts

1. Water circulates in a geothermal well
2. Temperature increases with depth
3. Rock types influence drill speed
4. Sandstone is preferable rock type for a water reservoir

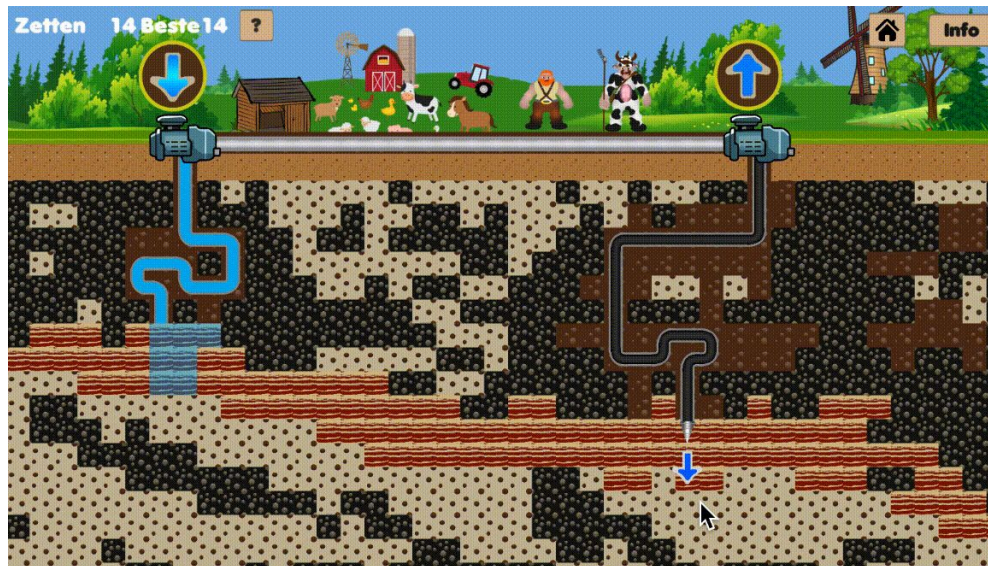
## How?

- The player's goal is to create a geothermal well
- Drill to the sandstone twice per level
- Teach through repetition
- A tile-based puzzle game



## Goal - Water Circulation

- Repeated animation
- Character text



# HOT PIPE

Goal -  
Deeper is hotter

- Steam shows heat



## Goal - Deeper is hotter

- Character text reinforces mission statement



## Goal - Deeper is hotter

- Electricity generation needs hot water



## Goal - Rock type influences drill speed

Limestone



Shale

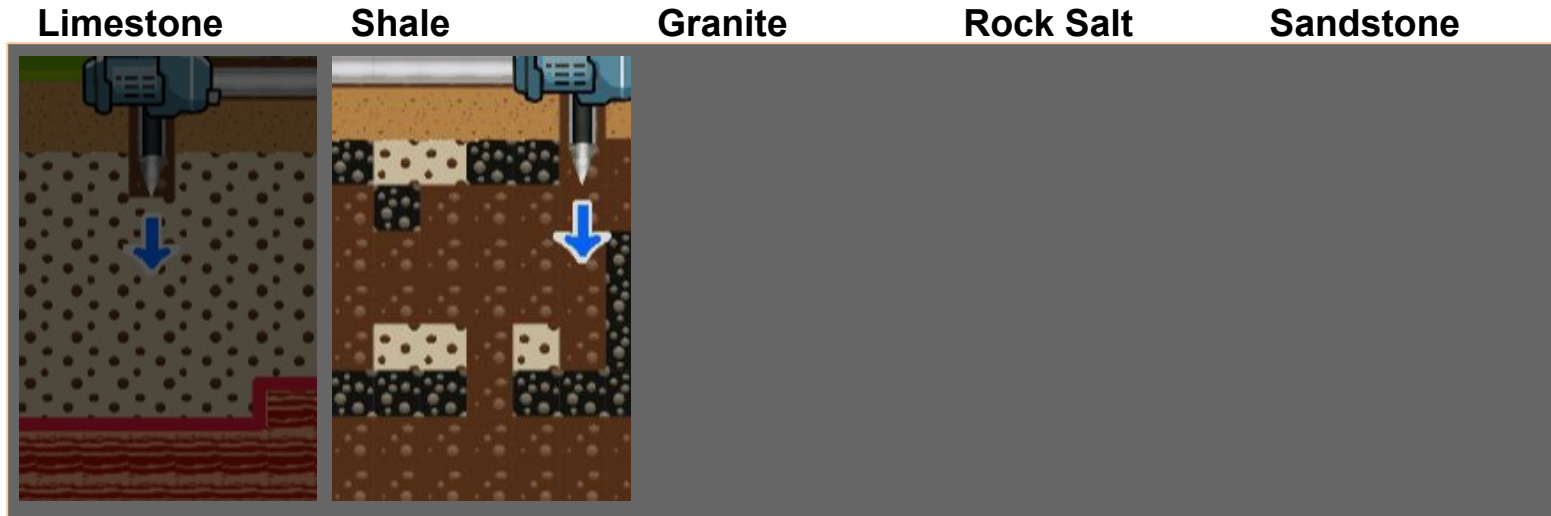
Granite

Rock Salt

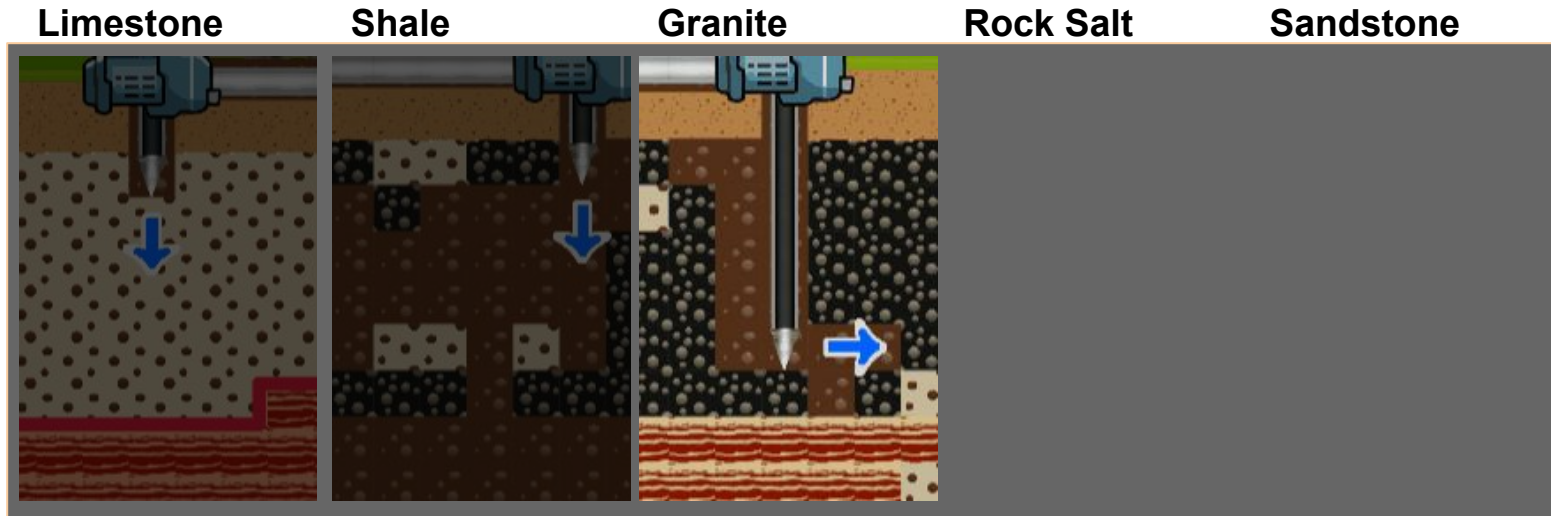
Sandstone



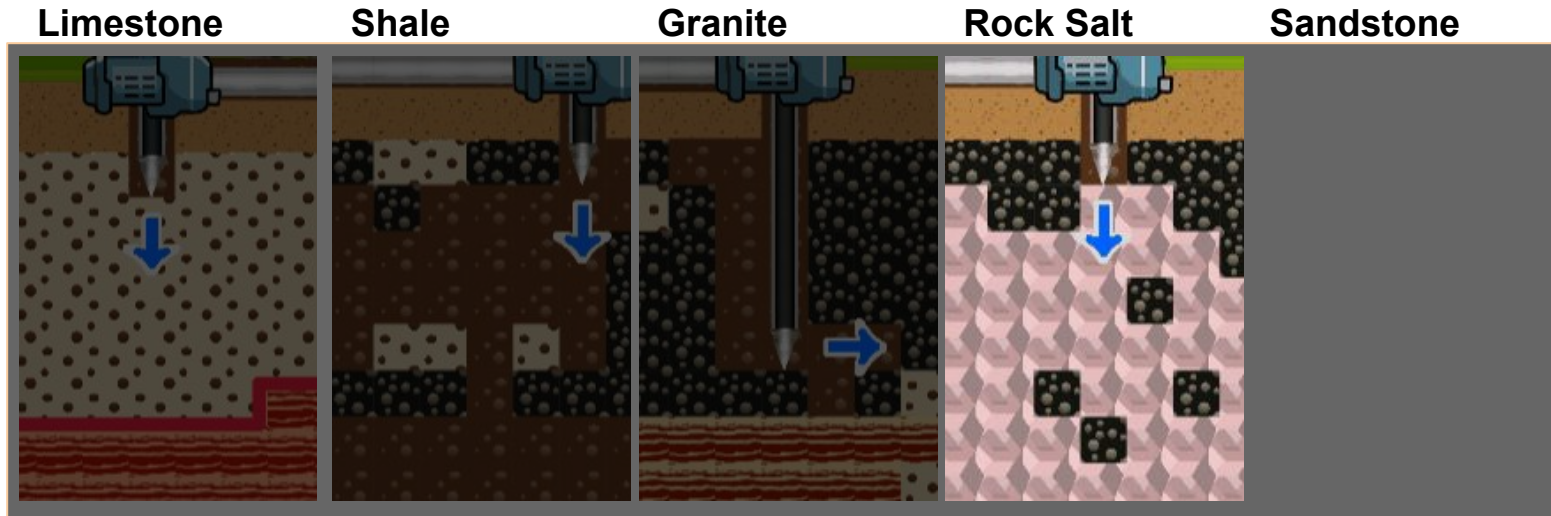
## Goal - Rock type influences drill speed



## Goal - Rock type influences drill speed

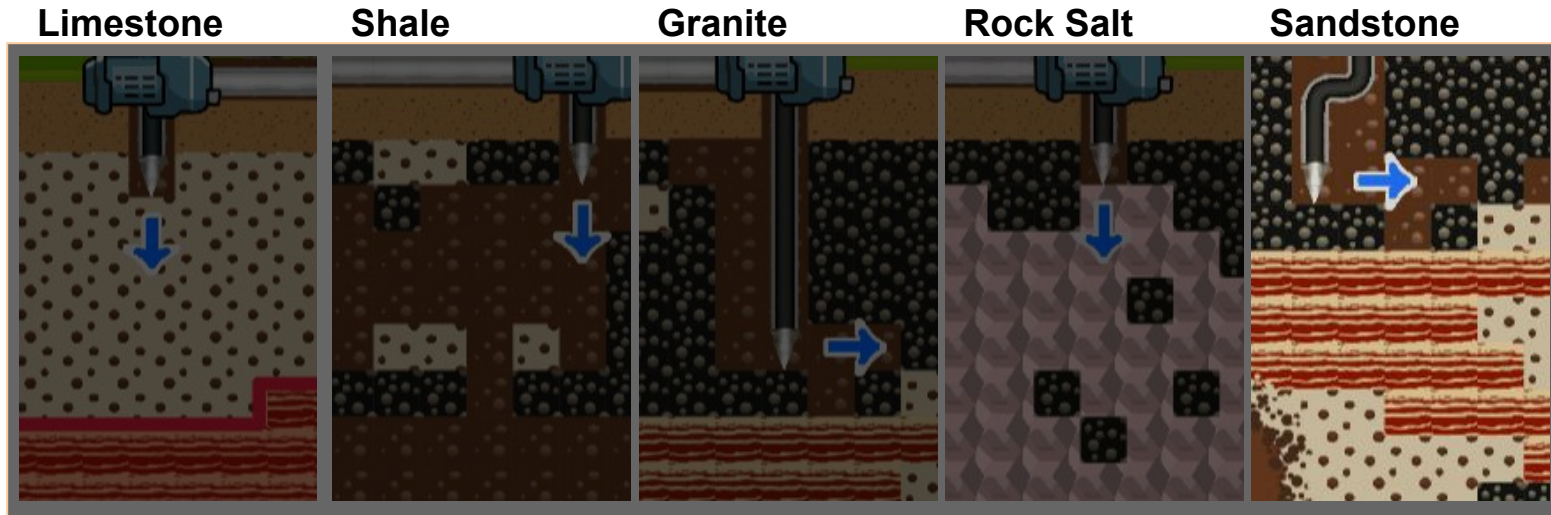


## Goal - Rock type influences drill speed

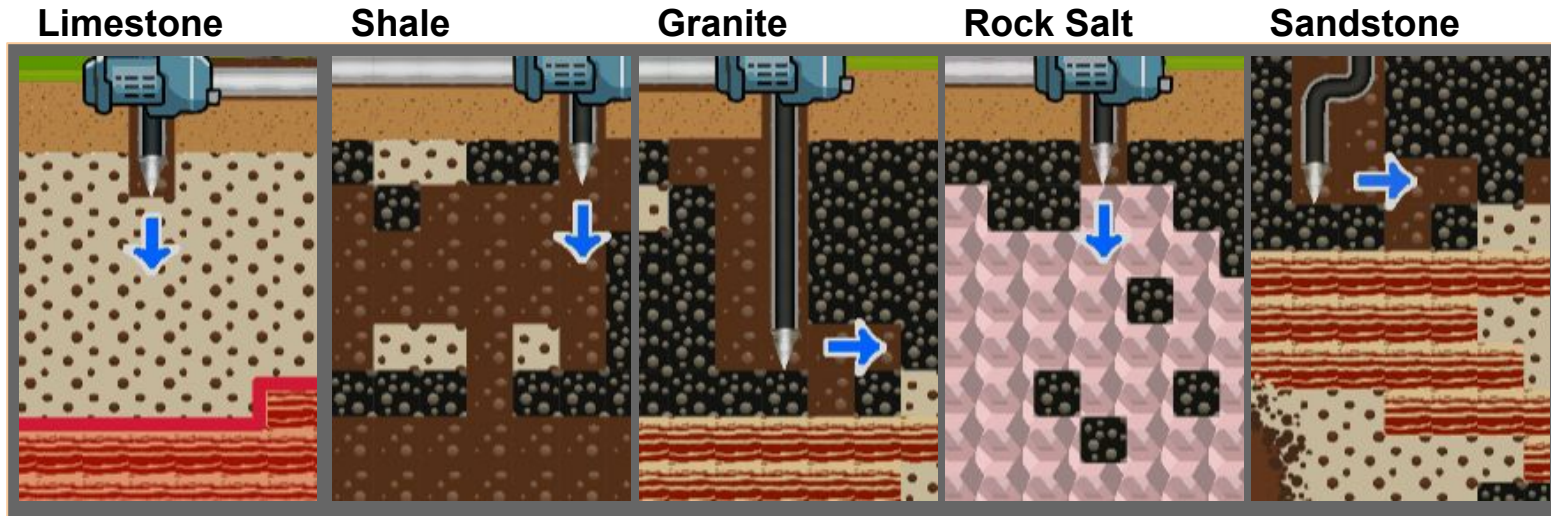




## Goal - Rock type influences drill speed



## Goal - Rock type influences drill speed



## Goal - Sandstone water reservoir

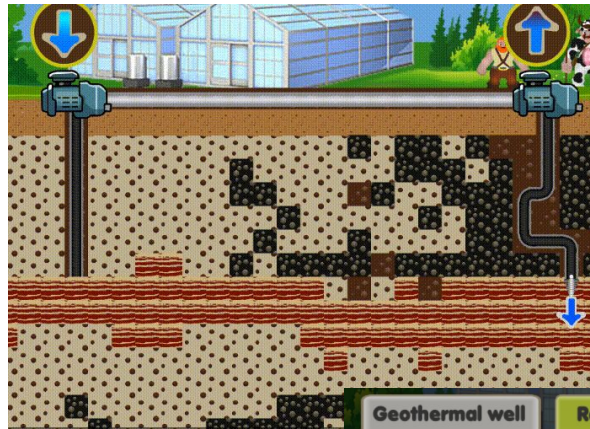


## Goal - Sandstone water reservoir






## Goal - Sandstone water reservoir




Geothermal well Rocks Characters Objects

**SANDSTONE**



[More information](#)

**REAL LIFE EXAMPLE:**  
Sandstone is made up of grains of sand packed together. Between the sand there is room for water to flow through and be stored. The larger the grains of sand the more room for water to be stored.



# Trailer video



## Development

- PuzzleScript: fast & easy tile-based editor
- Unity: cross-platform game engine

```

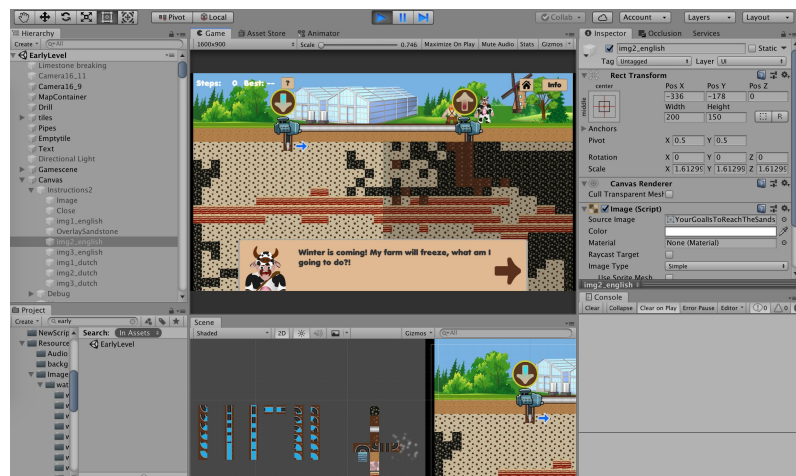
59  = Crate and Target
60  = Target
61
62
63
64  SOUNDS
65
66
67  Crate MOVE 36772507
68
69
70  COLLISIONLAYERS
71
72
73  Background
74  Target
75  Player, Wall, Crate
76
77
78  RULES
79
80
81  [ > Player | Crate ] -> [ > Player | > Crate ]
82
83
84  WINCONDITIONS
85
86
87  All Target on Crate
88
89
90  LEVELS
91
92
93
94  #####
  
```

```

srx1.
Checking win condition.

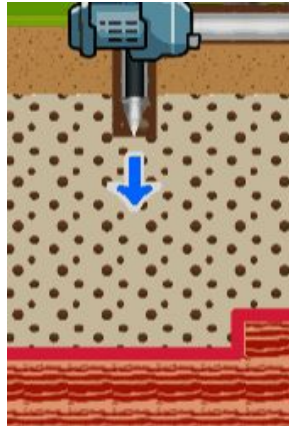
=====
Turn starts with input of
right.
applying rules
Rule 145 right applied.
applying late rules
Checking win condition.

=====
Turn starts with input of
down.
  
```



## Implementation

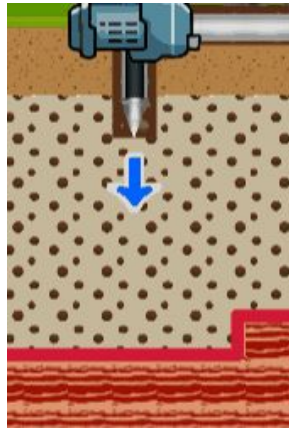
- Enhance the delivered knowledge
- More dynamic game feel





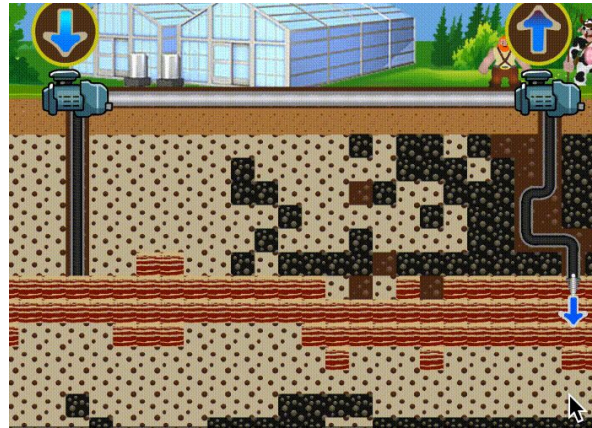
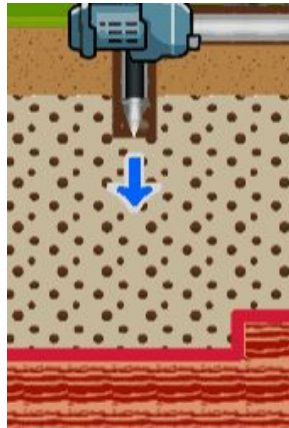
## Implementation

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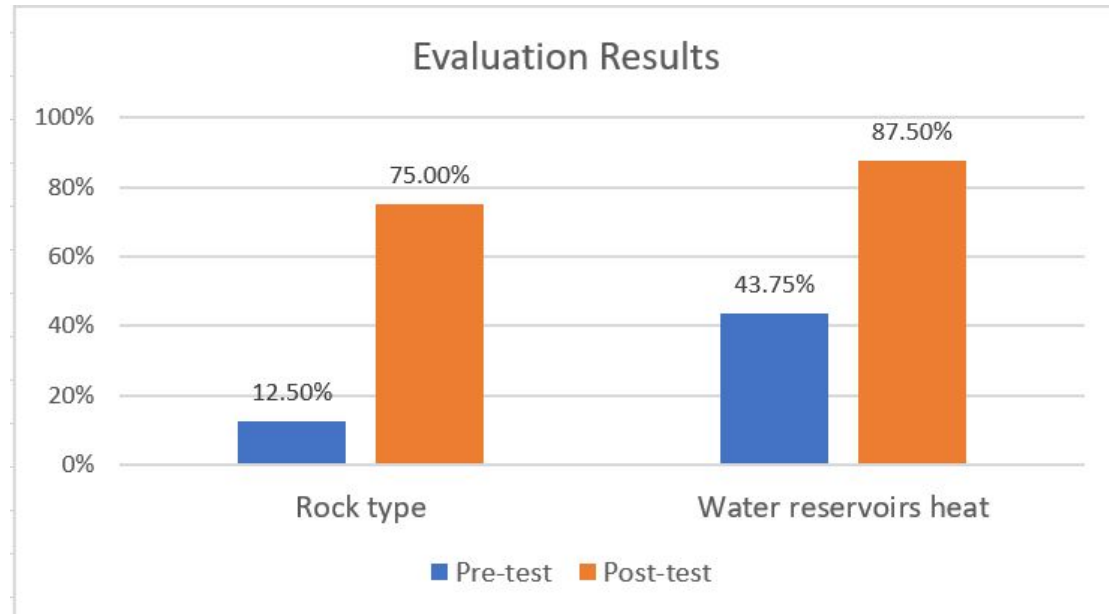


## Info page



## Results

- Pre-test Post-test
- 16 players



## Conclusion

- HotPipe is an intuitive puzzle game, which focuses on teaching geothermal system fundamentals.
- Knowledge about geothermal concepts increased significantly.
- The game can be played through this link:  
<https://hotpipe.itch.io/hotpipe>

# Acknowledgements

- the Department of Geoscience and Engineering, Delft University of Technology' - Phil Vardon
- Science centre Delft

# HOT PIPE

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# Thank you!



## Developed by:

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Dr. Thomas Reinsch

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Dr.Ir. Rafael Bidarra  
Tim Balint  
Nestor Salamon  
Science center Delft



**HOT  
PIPE**



[Link to game](#) / Video



