Water+: An Educational Game Based on System Thinking

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Abstraction: Team GameGrid worked with Creativity Labs at Indiana University to promote system thinking design through an educational game for upper elementary and middle school youth. Systems thinking is the process of understanding how components, regarded as systems, influence one another within a whole. We developed Water+, a 3D pipe-building game that can help children express their unlimited creativity and gain understanding about how systems work.

'Water+' consists of two parts – puzzle mode and sandbox mode. In puzzle mode, children need to combine pipes and game items to build their own system and fill given tanks with certain colors. In sandbox mode, they can create whatever system they want. While they play the game, children should consider the characters of components and the relationship between them. In this way, children can have a hands-on experience in system building. The pipe-building experience will guide them how to think more systemically.

Goal of the game

In our game, children need to combine components to build their own system. They should consider not only the characters of each component but also the relationship between components. Eventually, children can learn that a system is not a group of components but interconnections between components. In this way, children can have a hands-on experience in system building. We hope this lesson can give children a broader view about how things around them work. With our game, children will enjoy the gameplay while also learning how to think more systemically.

Challenges

Scope

The first challenge is scope. To build a puzzle/sandbox game with some degree of depth, we need a variety of well-designed mechanics. The version we showed at halves only had three mechanics: pipes, blender and pattern generator. And by the time of softs we were barely able to implement three more: T-shape pipe, pump, shifter, along with a few levels to show off these mechanics. As a result, the feedback we got from softs were most around the bugs and lack of well-designed levels. And we realized that we need to focus on not creating new mechanics, but polishing existing ones. Then we spent the next two weeks on fixing bugs and redesigning the levels of the game, which were proven to be a right decision and made our game a much smoother experience.

Interface

Another challenge is creating a smooth 3d pipe building interface. This was proven to be particularly challenging, partly because there really hasn't been many successful examples that we can learn from, partly because our platform requirements limited our interface to mouse and keyboard, which is not very suitable for locating an object on the screen.Even though still a bit too over responsive, but it remove the interface complexity from the overall complexity of the puzzles.

Learning Curve

The third challenge is designing a good learning curve. Up until softs, only a few people were able to play our game without some sort of help from us, the rest were usually frustrated before even trying out all the mechanics. We discusses this with our advisors and faculties, and we finally realized that the mistake we're making was giving our player too many challenges at a time.

How we handled them

Since half point of the project, we had two playtests with visitors of our school, who are children aged from 10-14. And we also had playtests with peers and faculties when 80% of the product done. Along with playtests, we kept collecting feekback, iterating on UI and updating game mechanics.

After it, we realize that although we understand our game well, the communication between our game and the user is broken. So changing the learning curve is very crucial for our game since we have a unique 3D gameplay and many rules that the user need to understand.

By redesigning the tutorial levels and UI, we focused on UX, which turned out to be a significant chaining point for our project. People started enjoying the puzzles without suffering from frustration.
In the latest playtest, children gave us a 4.5 average score in scale of 5 on feeling comfortable with our 3D gameplay, which was 3.5 in the earlier playtest. And 100% of the children understand the fundamental tools in our game now.