# Trainyard:
A level design post-mortem

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- I'm Matt Rix, the creator of Trainyard
- This talk is called a "post-mortem", but really it's just me talking about my philosophy for how I created the levels in Trainyard

What is Trainyard?

- What is Trainyard?
- It's an iPhone puzzle game
- I spent a year creating it in my spare time
- In October of 2010, it got a lot of buzz and climbed up to #2 on the App Store, behind only Cut The Rope
- Gradually went down the charts, but it has done really well.
- It has sold over 800,000 copies at a price of 99c.
- The free version, Trainyard Express, has been downloaded over 4 million times.
- I was able to quit my job, and now I'm working full time making games
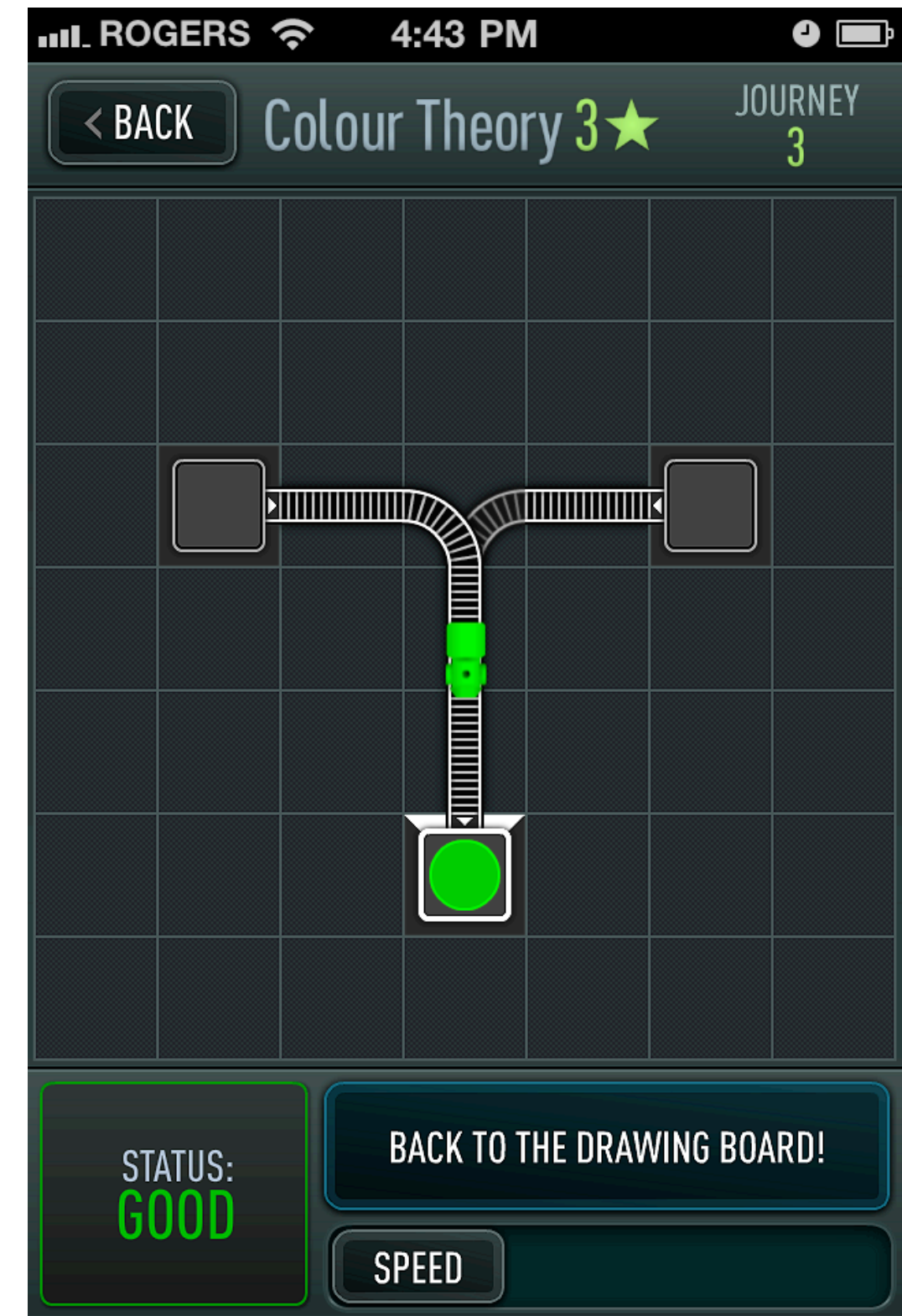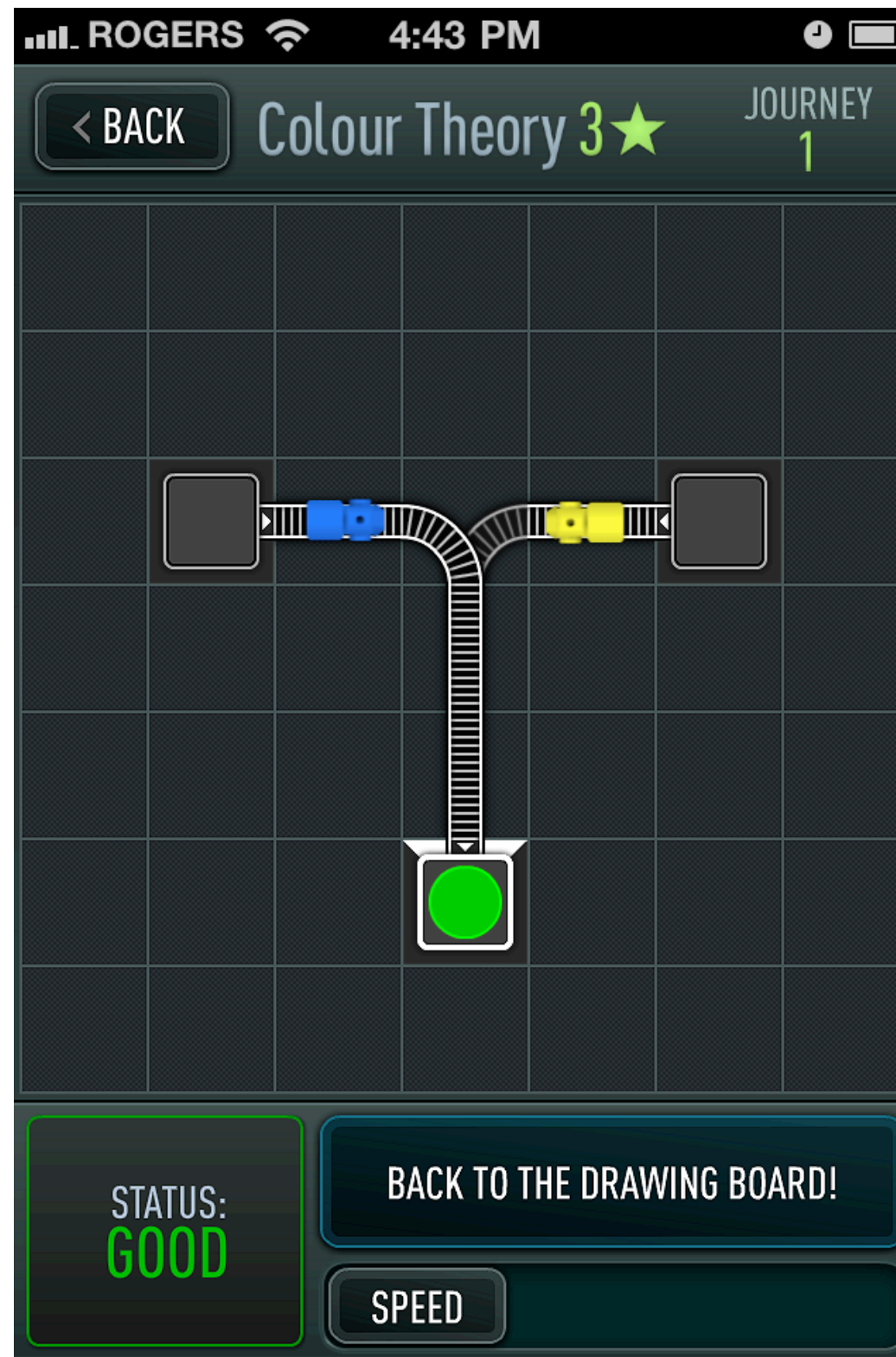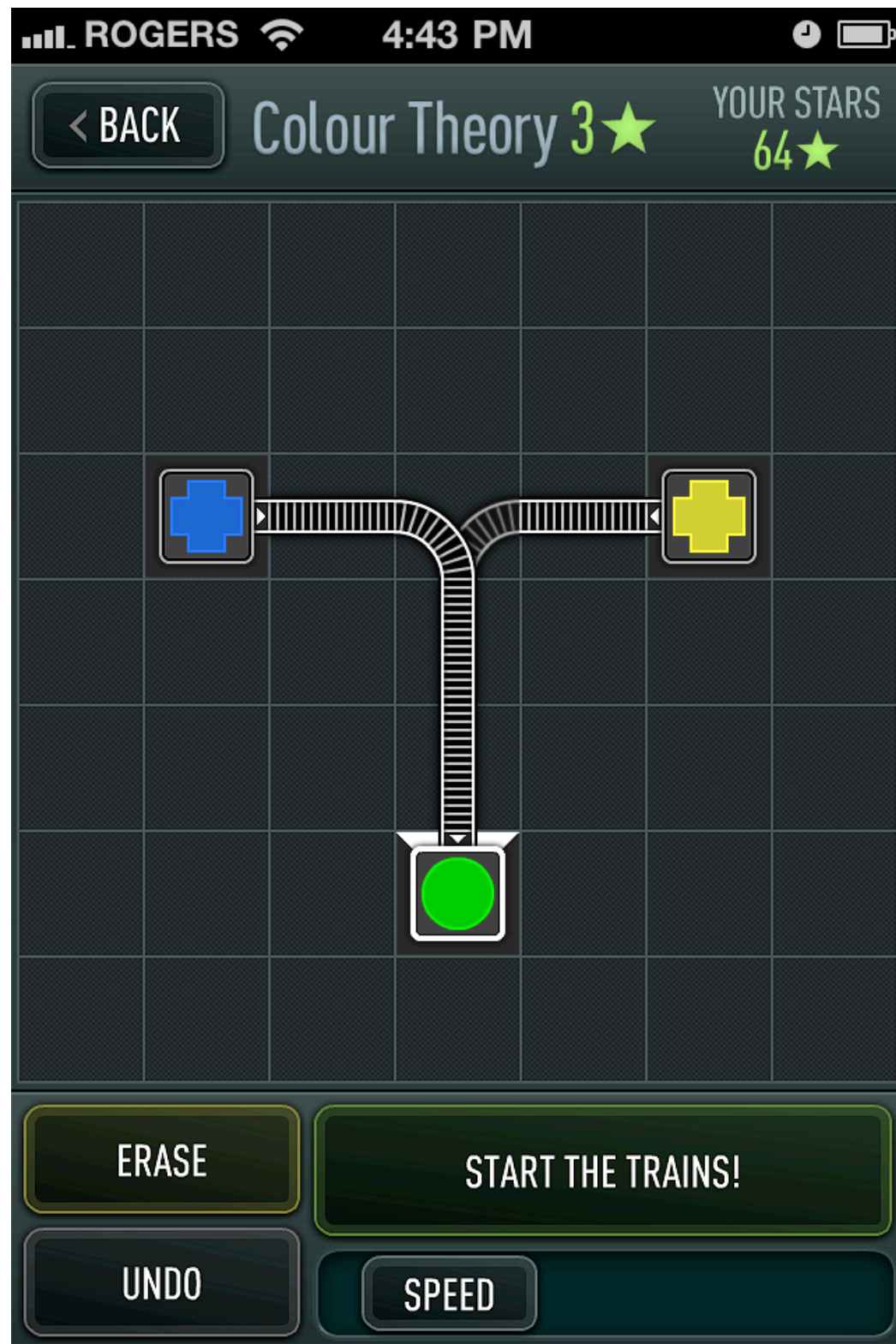
- The actual game is a logical puzzle game

- There are no timers and no scores, the only thing that matters is solving puzzles

- The only way you interact with the game is by drawing tracks.

- You draw tracks, and then the trains come out and follow them.

- Timing and colour mixing play a big role.

- In the example on the screen, the blue and yellow trains are going to mix to form a green train.

Level design = Teaching

- I like to think about level design as teaching

- To show why this is the case, think about any level-based game you've played recently

- Imagine playing that game, but taking the last level in the game, and making it the first level

- It'd be hard to play, right? Most of us would probably get frustrated and give up

- It's an obvious fact that all level based games go from easy to hard

- What's really happening is that the game is gradually teaching you how to play over the course of all the levels

- By the last level, you're an expert at the game, you have a certain amount of mastery over it.

- There are many other comparisons we can make to teaching:

- Do some students get frustrated because it's too hard

- Do some students get annoyed because it's too easy

Consider the target audience

- As a teacher, you really need to know who your students are

- In the case of Trainyard, I knew I wanted to make a game for the general iOS audience, a "casual" audience

- There are some perceptions that casual gamers are less intelligent than regular gamers, but I don't think that's true

- Casual gamers simply don't have the understanding of many fundamental game skills and techniques that most of us take for-granted because of our years of gaming.

- Trainyard is not a casual game. It's very abstract, and the game gets very hard and complex.

- Yet I hear many stories of "casual" players beating the game.

- This is because I focused on making the learning curve very gradual and had really good tutorials.

Level design: "Micro" and "Macro"

- As a Starcraft player, I like to break everything into "Macro" and "Micro".

- Level design "macro" is the overall flow and organization of the levels.

- Level design "micro" is the actual creation of levels and the specific level details.
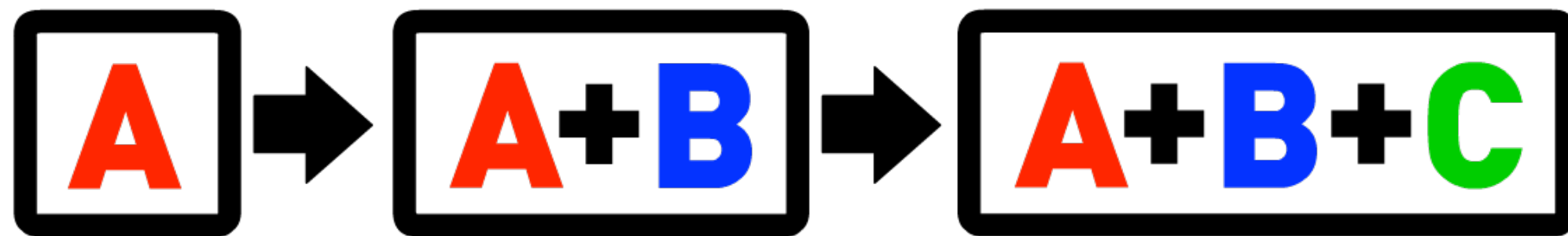
Level design: Macro

Add elements progressively, one at a time

- It's important to add elements only one at a time

- Teach the player in very small amounts in each puzzle

- A taught element could be: an actual new game piece, a certain way of using the existing pieces, or physical dexterity

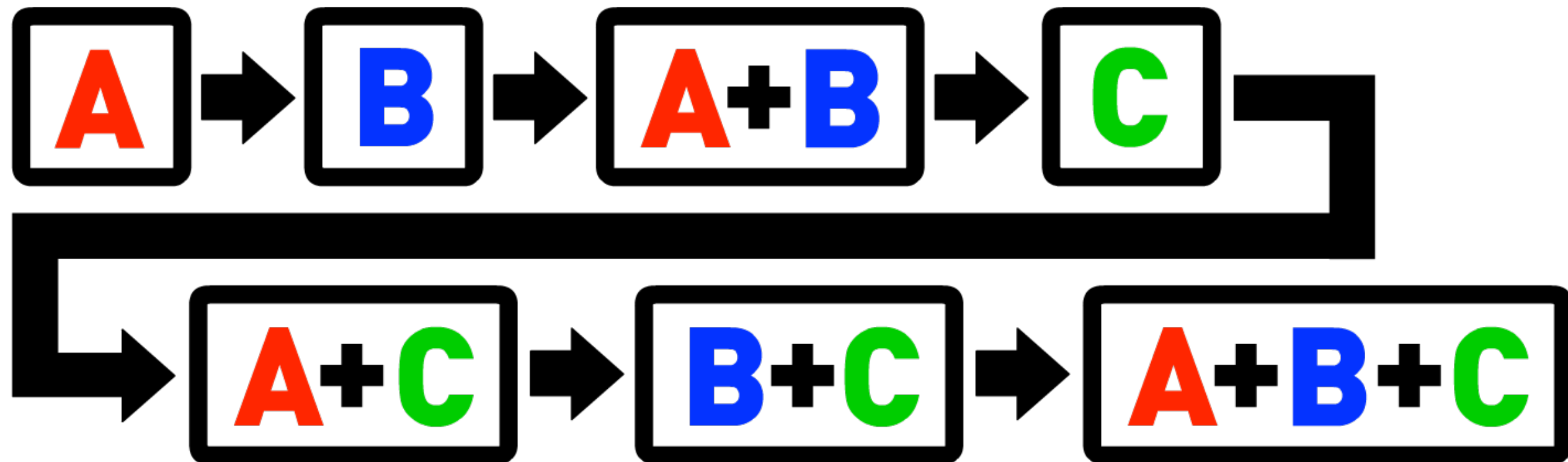# Treat a combination of elements as if it was a new element

- It's also important to treat combinations as if they were new elements

Compounding elements

- This shows how a lot of typical games that are built for "gamers" approach level design
- but with a game aimed at casual players, I think it's important to be more granular

Treating combinations as new elements

- Here you can see an example of treating combinations as elements
- Each box around the letters represents a level
- This means you'll end up with more levels, but the flow will also be much smoother

Instructions

- One of the early versions of Trainyard had text for the instructions on how to play, but it just didn't work

- The reason is that nobody reads text

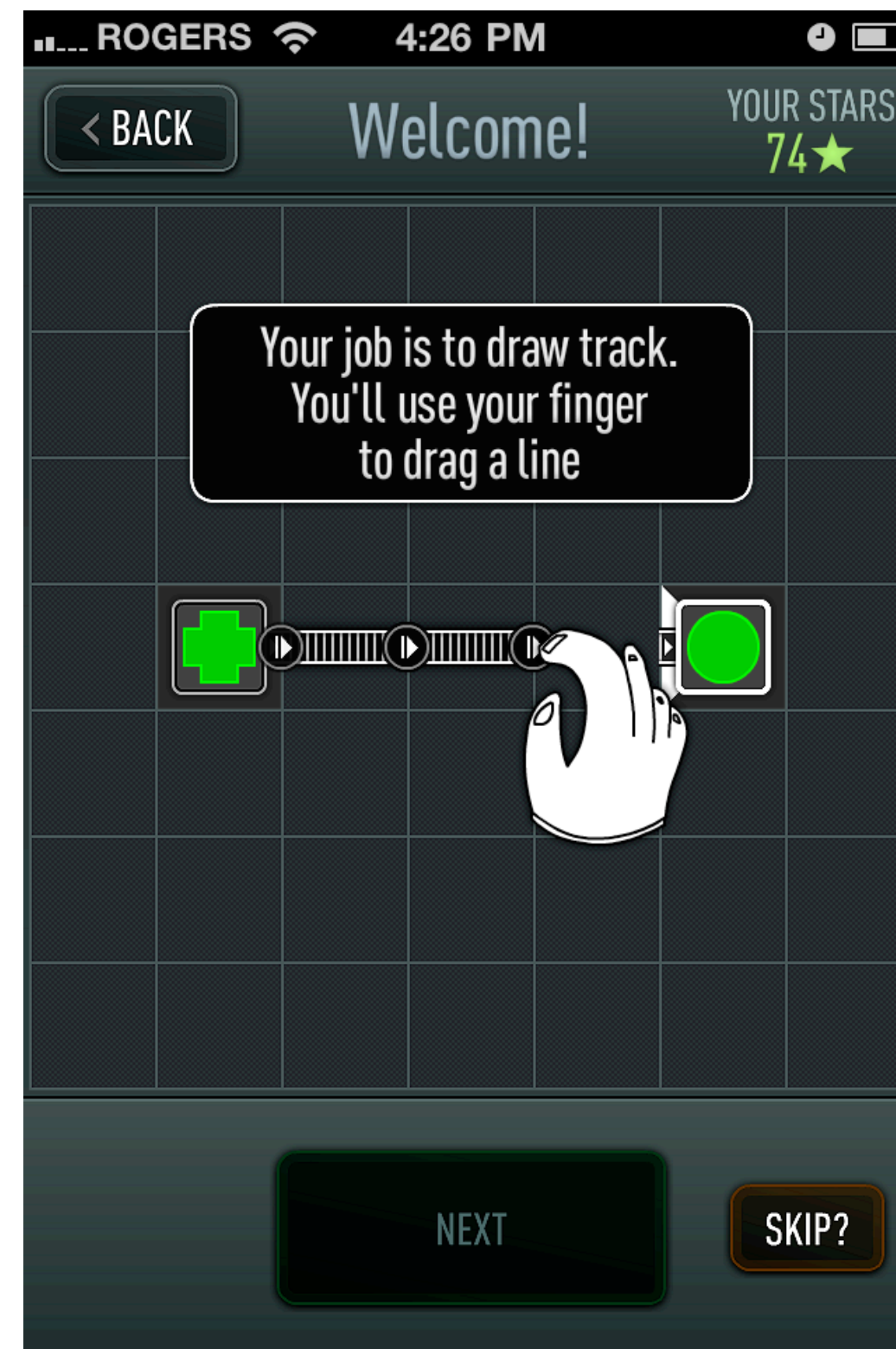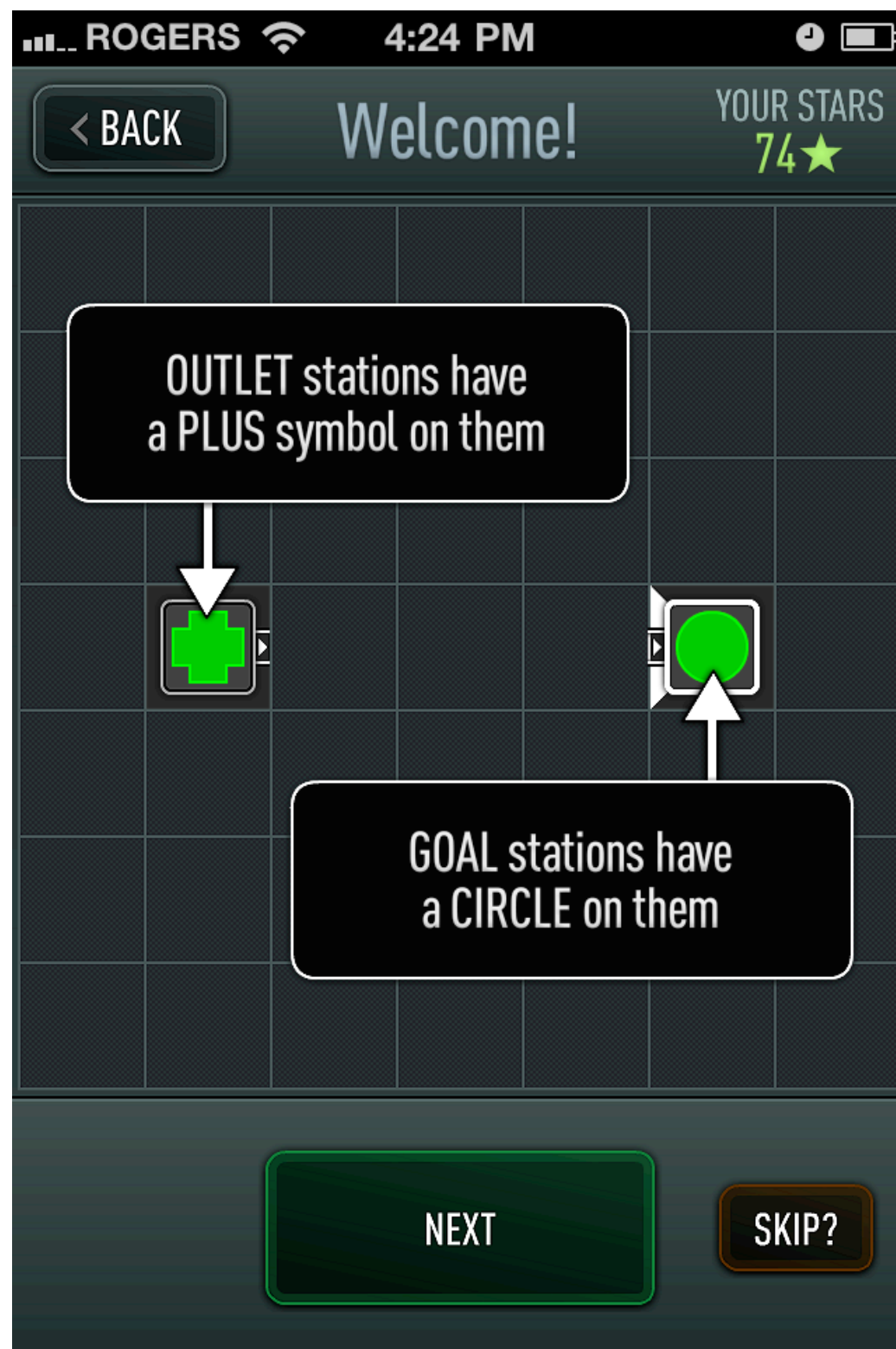- You really need to approach your instructions in a visual way
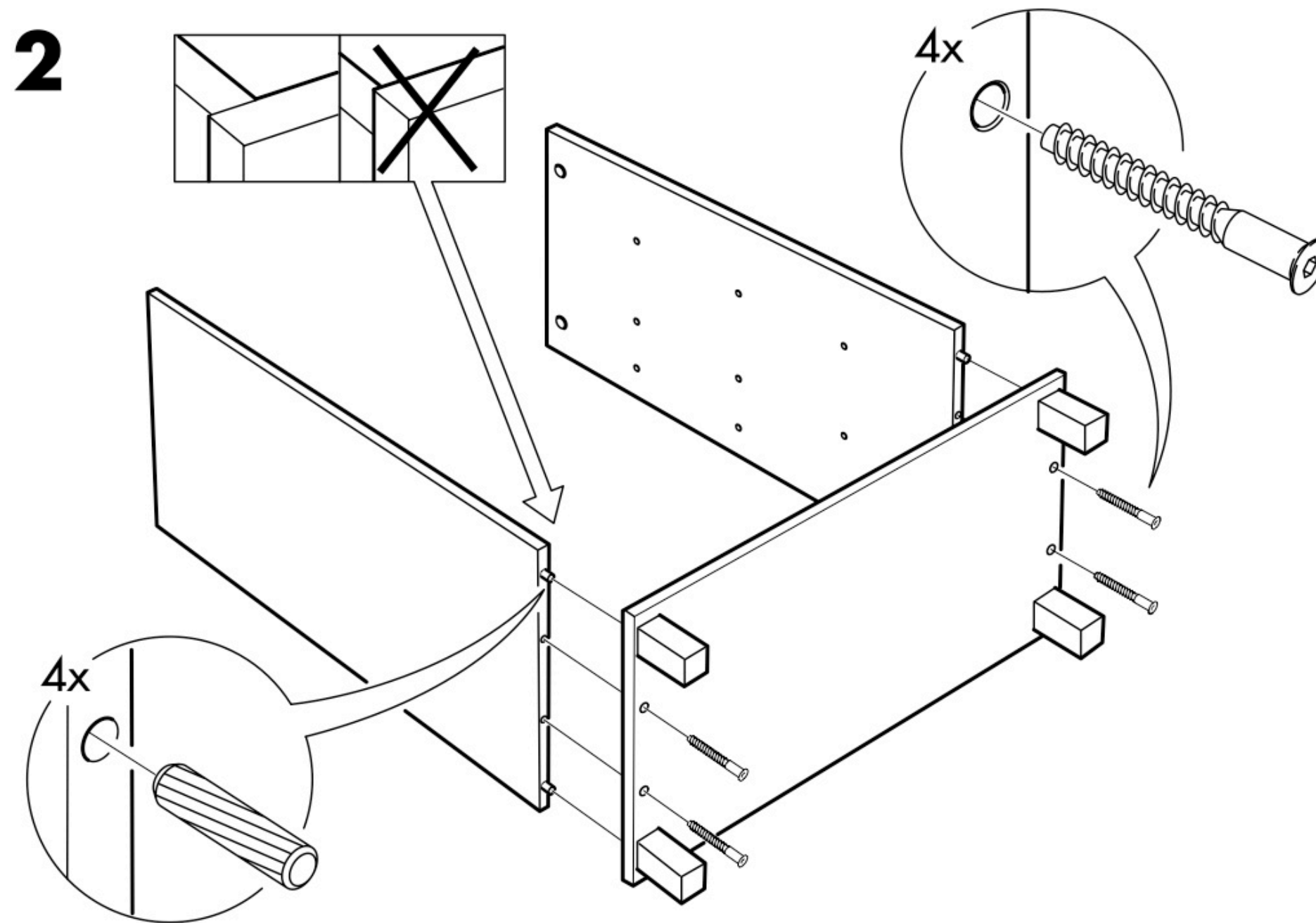
- An example of this is an Ikea furniture manual

- Notice how there is no text at all, and yet you can still use it to assemble a complicated piece of furniture

- Assembling Ikea furniture is harder than most games out there
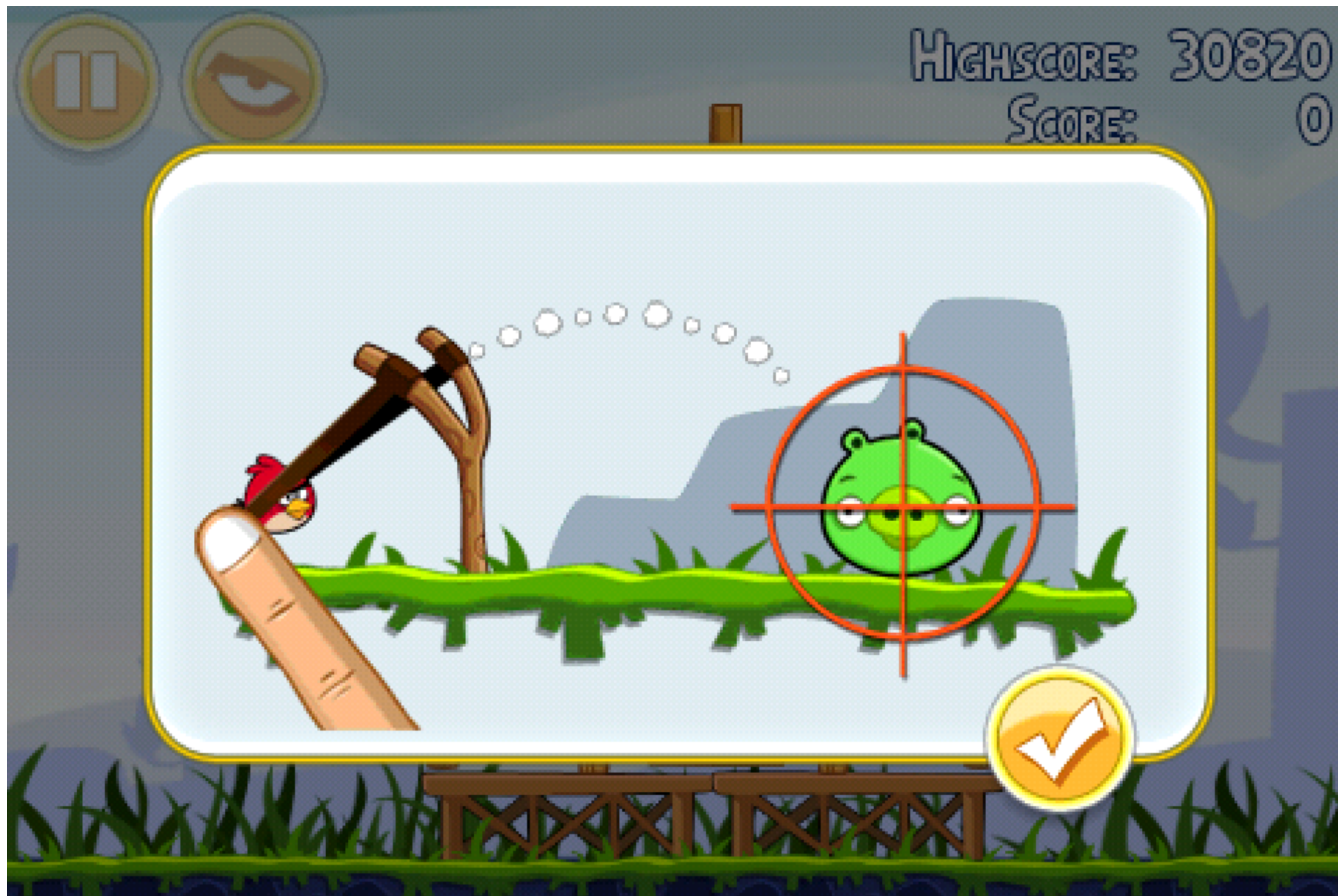
- Here's the instructions screen for Angry Birds.

- Notice how there is no instructional text?

- Besides the fact that this approach is way easier to understand, it also means that localization isn't nearly as big of an issue

- Here's an exercise I like to do.

  - Take your game and replace all the text with Windings (or any other symbolic font).

  - Give the game to someone who has never played it before. Can they still figure out how to play?

If you're trying to teach something complex to the player,
show the game being played

- Pictures are great, but if you're explaining something more complex, you need to show the game in action

- Trainyard requires the player to understand a lot of complex techniques
- So I created a very flexible and robust tutorial system
- It runs on top of the actual game engine, there's a virtual hand that fires real touch events
- I've received lots of email from people that love the tutorials, and tell me how much they helped

Only teach the player what they need to know right now.

- Don't tell the player everything at once. A lot of games do this with an initial "instruction screen" and that's it

- I believe you should tell them only what they need to know to solve the next few puzzles

- Otherwise, they will be overwhelmed at the start, so they won't learn the important things

- And then when they actually need those things, it'll be too long since they saw the instructions

- In the case of Trainyard, it starts with a super simple tutorial on just drawing a straight line

- Then there are a few puzzles to let them practice that

- Then there's a tutorial that teaches them how to draw a cornered line

- There are 8 tutorials in the game, and the last one doesn't come until they're 70 puzzles into the game

Make sure the player has to use every skill you teach them

- If you teach a skill to a player, either through gameplay or through tutorials, make sure to let them practice it

- Don't just teach them once, and then never require them to use that skill again until the hardest puzzle of the game

- Constantly return to all the skills and techniques they've learned so that they don't forget them

Difficulty

Progression
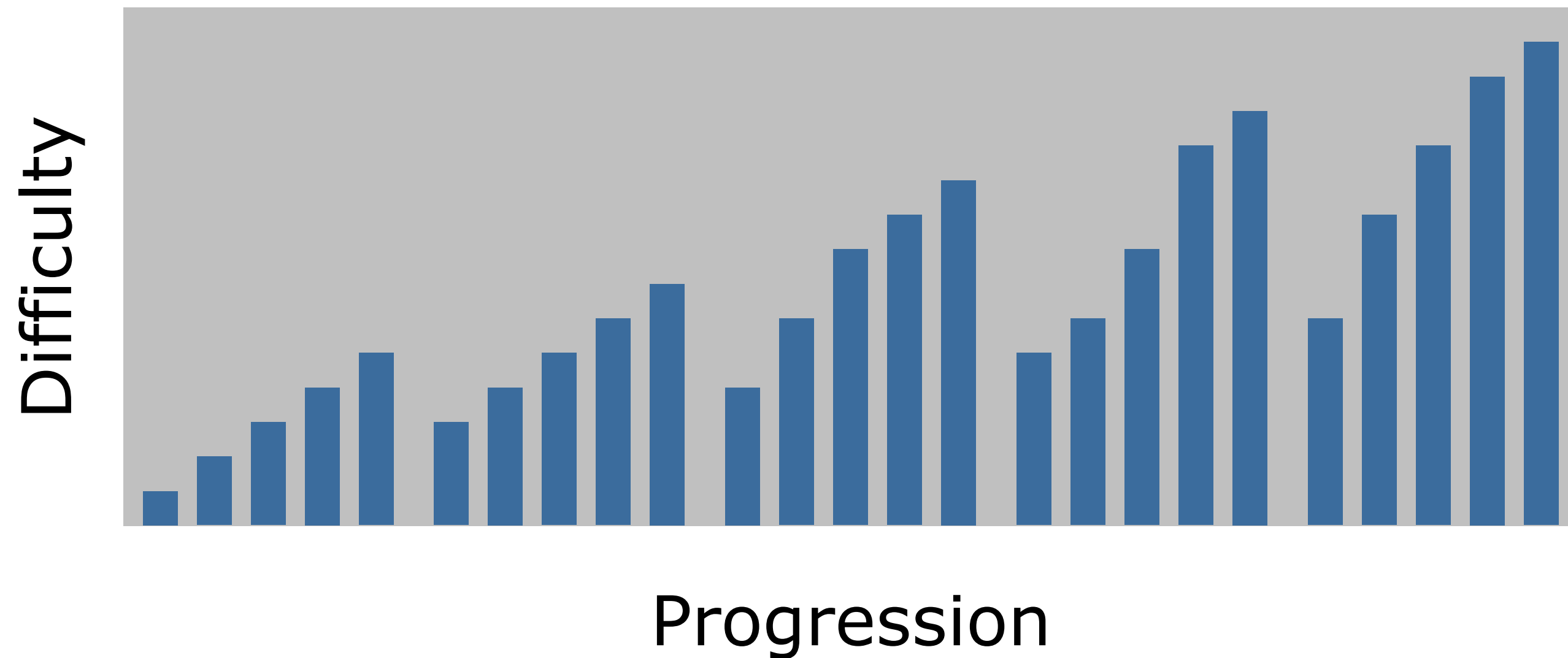
- This is an over-simplification of the overall difficulty curve of Trainyard

- Basically, after a few hard puzzles, the player is given some easy puzzles again

- The puzzles get harder over time, but it's good to give the player breaks

- The easy level breaks are also great times to reinforce certain fundamental techniques

Level unlocking

- Consider how your levels will
unlock
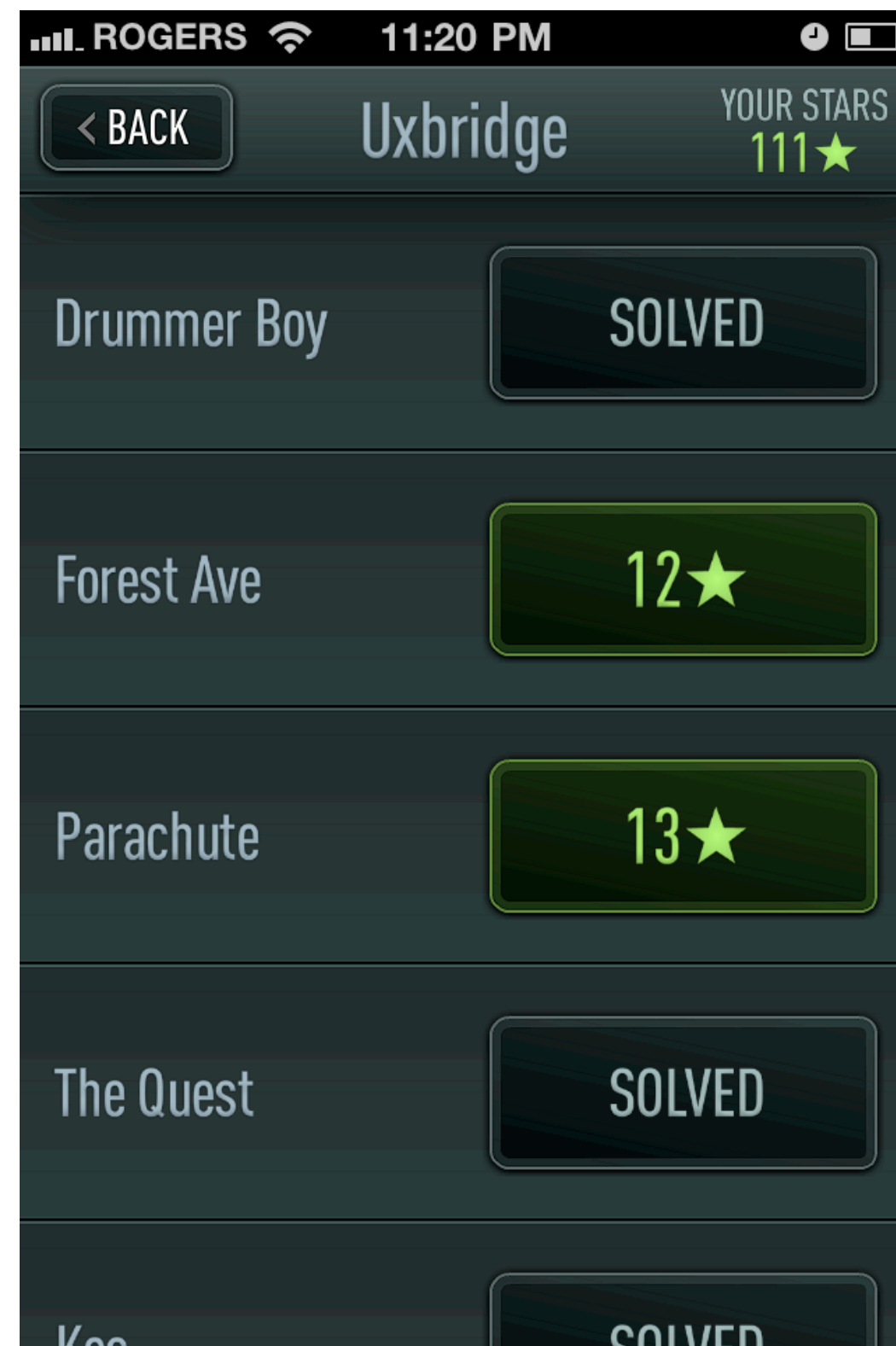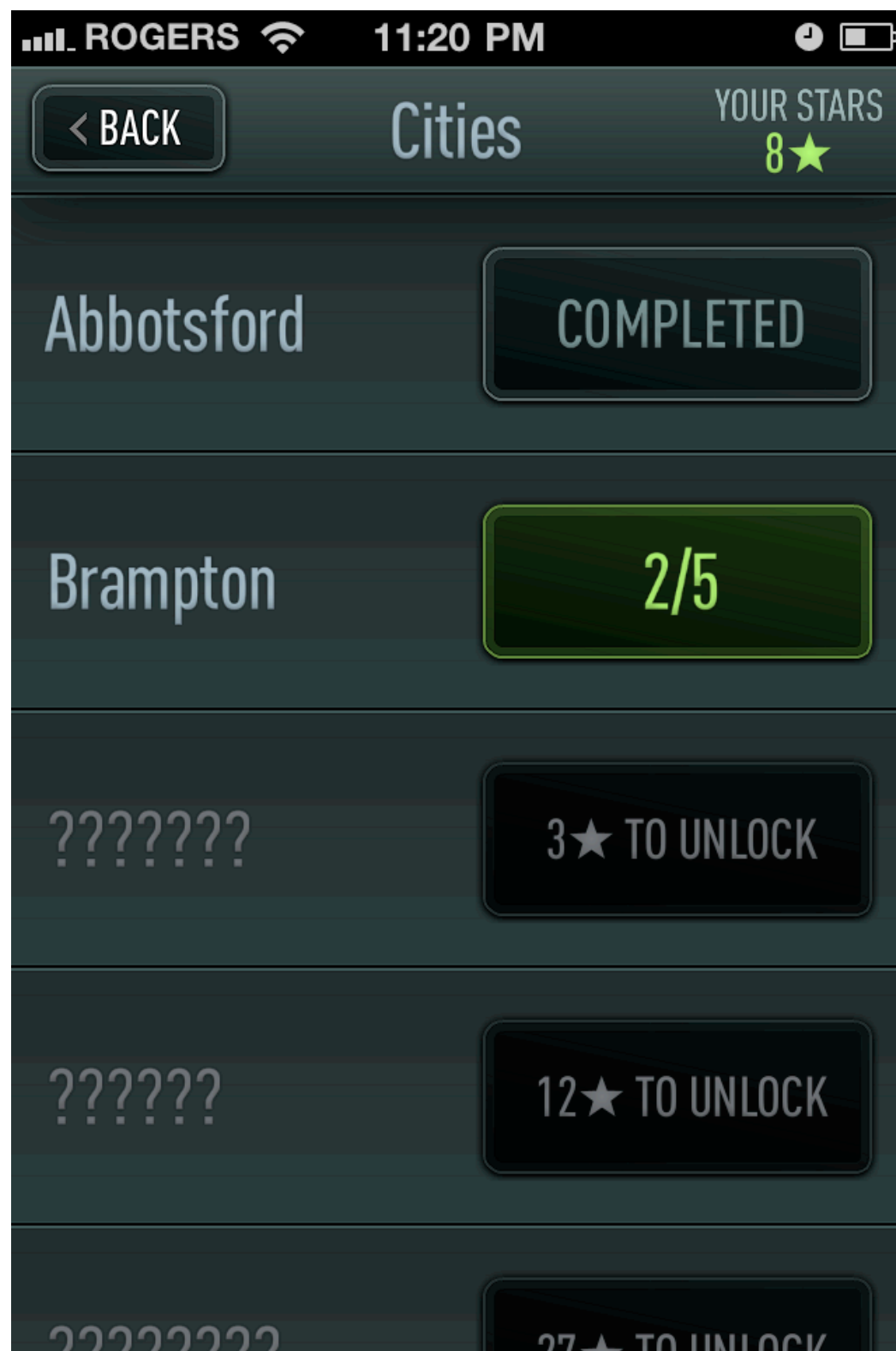
- In Trainyard, there are groups of puzzles that are unlocked when the player earns a certain number of stars
- Each puzzle has a "star value", which is representative of the difficulty of the puzzle.
- ex. easy puzzle, 1 star, medium puzzle, 5 stars, hard puzzle, 15 stars.
- This approach worked, but players had a tough time comprehending the stars and what they were really for

Give players an option to unlock all the puzzles

- I used to get lots of email complaints from players about losing their data

- Sometimes they would switch devices, or get a new device

- They didn't want to have to play the game from the start all over again

- My solution was to put an "unlock all puzzles" button in options

- This solved tons of issues, and only took a couple hours to implement properly

Consider having a "main game" and "bonus levels"

- Another thing I'm really happy with is the overall puzzle structure

- When someone solves the first 100 puzzles in Trainyard, they're greeted with a screen that says "Congratulations, you beat the game!"

- Also on that screen is a tiny button that says "Want more? Play the bonus puzzles".

- Casual players would get to the game over screen, and walk away from the game happy, without ever playing the bonus puzzles

- Hardcore players would have many more puzzles to solve.

Casual
Completionist
Hardcore

- However, I discovered one issue.

- It turns out there are really 3 types of players

- "Casual players", that only play the main puzzles

- "Completionist" players try to finish everything you throw at them

- "Hardcore" players are way better at the game than I am

Don't put nearly-impossible levels in the game at all

- The last section of bonus puzzles in Trainyard is incredibly hard

- These are puzzles that took upwards of 5 hours for me to solve

- It turns out that the "Completionist" category of players got very frustrated at these puzzles because they were so hard

- "Hardcore" players are better than me, so they solved everything anyway.

- In the future, I just wouldn't put these ultra-hard puzzles in.

- Completionist players would be happy, and hardcore players are never satisfied (at least until you make a level editor!)

- Also, create these puzzles can be a hue drain on your time.

Level design: Micro

- Now let's talk about level design "micro", the actual creation of specific puzzles

Each level should have a purpose

- It's usually a good idea to know what the purpose of a puzzle is before you start to make it

- There should be some reason for that puzzle to exist in the flow of the game

Aim for symmetry and balance, everything should be intentional

- This is a puzzle called "Magic Carpet"

- You can see the rainbow feel and how it's diagonally symmetrical

- Having some sense of order makes the puzzle feel hand-crafted, rather than procedurally generated

- I always try to make sure that my puzzles have balance and structure

Don't include extraneous elements just because you can

- This is an example of a player created puzzle
- First, you'll noticed that it doesn't really have any balance or symmetry
- But the thing that bugs me the most is that rock in the middle
- Rocks in Trainyard only do one thing, they block you from making track in a square
- One of the best things in Trainyard is that there are thousands of possible solutions for each puzzle
- By adding a rock into the puzzle, the creator decreased the number of possible solutions
- I imagine that the creator solving it, and then adding rocks in all the squares they didn't use
- This forces the solver to solve it the creator's way, rather than their own way
- As an aside, I think this is why solving puzzles was more fun in Portal 1 than in Portal 2

Use themes to add variety

- Once you're quite far into the game, and the player has a good idea of how things work
- You can make some more interesting puzzles
- I like using themes to make things interesting
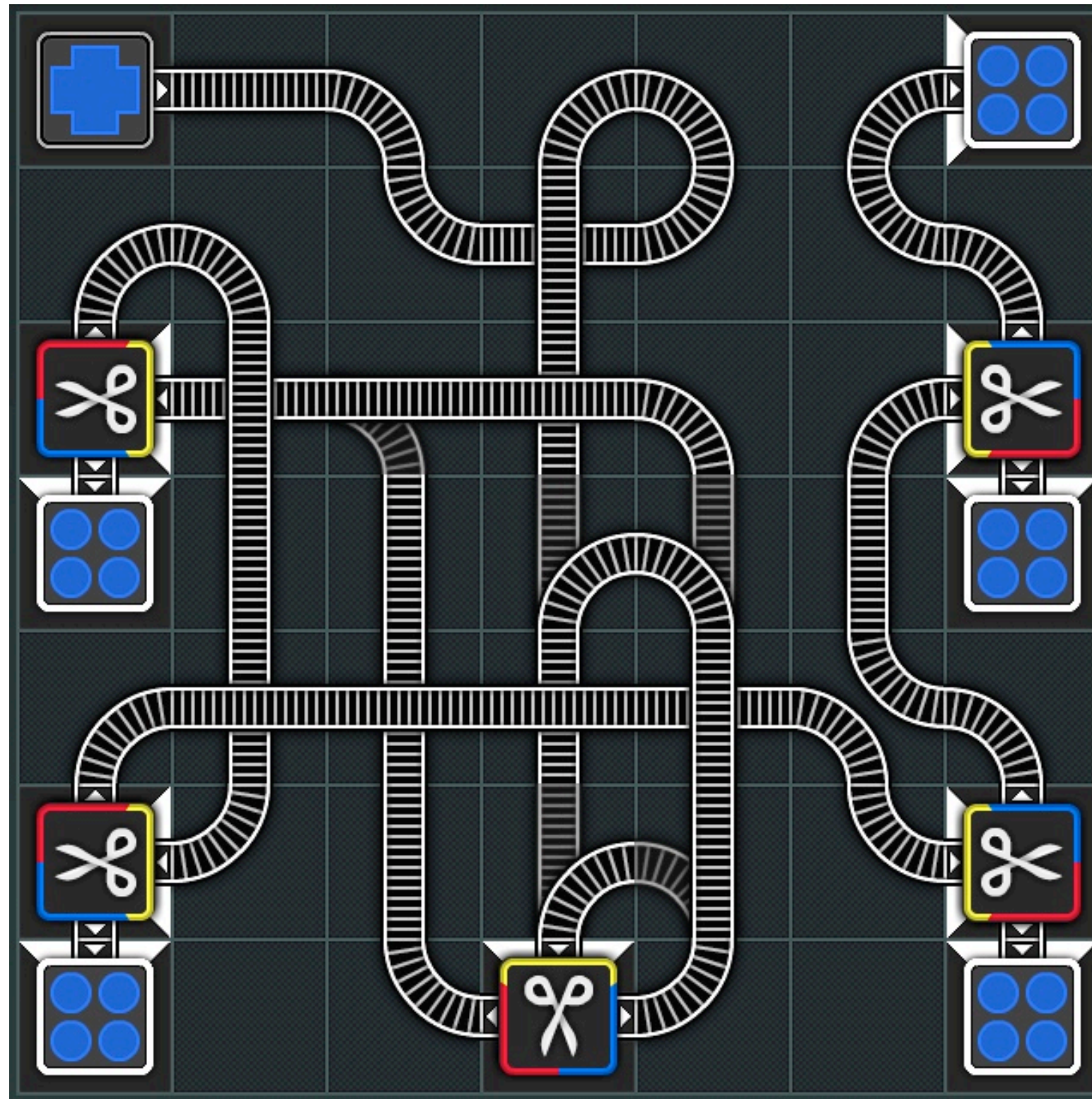
- Here's one example of theming, it's a puzzle called "Cooksville Creek"

- This puzzle is meant to evoke the feeling of a river

- You start with one blue train, and it gets multiplied into many blue trains, which then flow around the screen

- This may seem a bit cheesy, but I think most players enjoy it

- It helps to show that the puzzle has been hand crafted.
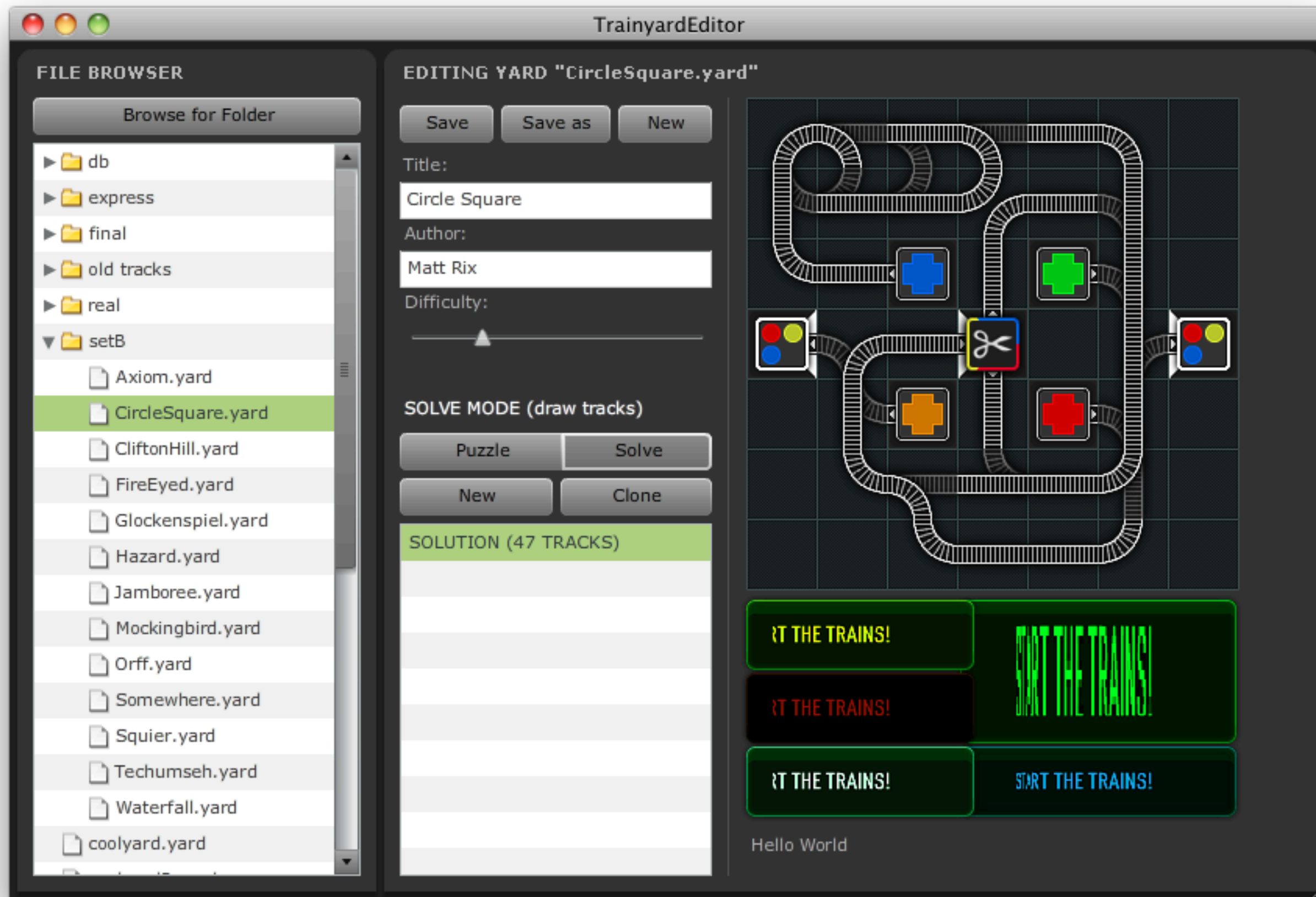
Don't overwhelm the player
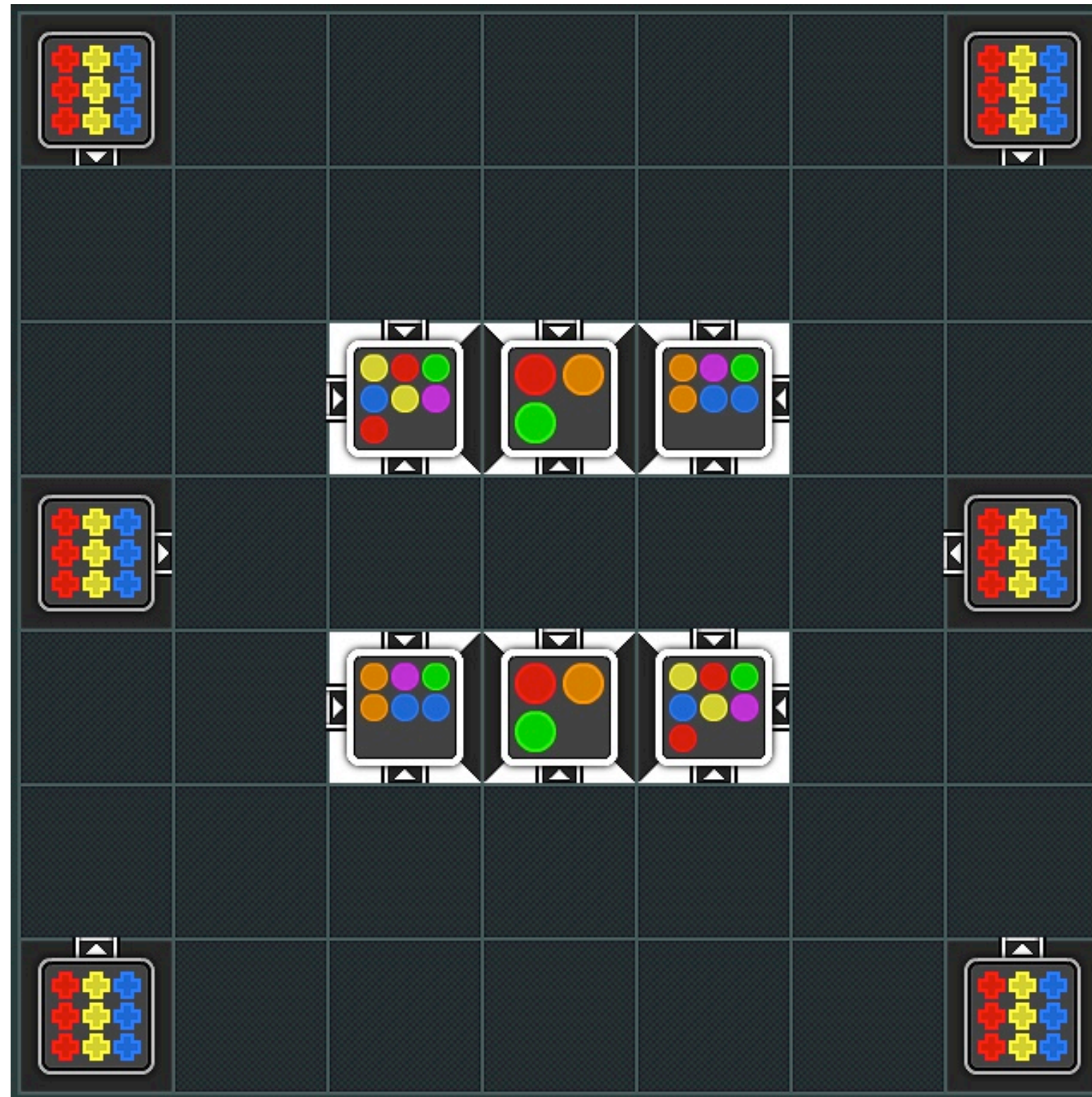
- This is another player-made puzzle
- Most Trainyard players will look at this puzzle and be instantly overwhelmed, because you start with over 50 trains
- I believe that the solver needs to be able to fit the whole "state" of the puzzle in their head at once
- You may have that is an "easy" puzzle, but if there are too many elements to work with, the player will still get overwhelmed and frustrated
- Keep the number of active elements to the bare minimum to fulfill the puzzle's purpose

A player should never say "I don't know how I did that" after solving a puzzle

- You will either hear a player say this, or if you watch them play the game, it becomes really obvious when they've given up and they're doing trial-and-error.

- This means there is either a big flaw with your game design

- Or more likely, you need to insert more puzzles before this point in the game to smooth out the difficulty curve

Make a level editor

TrainyardEditor

FILE BROWSER

Browse for Folder

▶ 📁 db
▶ 📁 express
▶ 📁 final
▶ 📁 old tracks
▶ 📁 real
▼ 📁 setB
　📄 Axiom.yard
　📄 CircleSquare.yard
　📄 CliftonHill.yard
　📄 FireEyed.yard
　📄 Glockenspiel.yard
　📄 Hazard.yard
　📄 Jamboree.yard
　📄 Mockingbird.yard
　📄 Orff.yard
　📄 Somewhere.yard
　📄 Squier.yard
　📄 Techumseh.yard
　📄 Waterfall.yard
📄 coolyard.yard

EDITING YARD "CircleSquare.yard"

Save　Save as　New

Title:
Circle Square

Author:
Matt Rix

Difficulty:

SOLVE MODE (draw tracks)

Puzzle　Solve
New　Clone

SOLUTION (47 TRACKS)

RT THE TRAINS!　START THE TRAINS!
RT THE TRAINS!
RT THE TRAINS!　START THE TRAINS!

Hello World

- It's important to have a visual puzzle editor so you can really see the structure of the puzzles
- The most important feature for a puzzle editor is some sort of "cloning" or "versioning" system.
- This will allow you to make non-destructive changes so you can iterate and experiment as fast as possible
- Along the same lines, the process of switching between making levels and trying levels out should be as fast as possible to encourage iteration and experimentation.

Making players happy

- Finally, I want to talk about making players happy

Amplify the player's internal joy

- Puzzle games, by their nature, and inherently enjoyable

- The human brain loves learning things

- Because of this, I didn't need to rely on tons of externals motivatiors

- That's why Trainyard doesn't have experience points, or even a score

- But the one thing that I do recommend is finding those moments when the player will be intrinsically happy, and amplifying them

- In the case of Trainyard, and most puzzle games, that big moment happens when you solve a puzzle

- So in I go crazy with particles and sound effects and make a big deal of it when the player solves a puzzle

Discovery of untaught mechanics can lead to player delight

- Allowing players to discover game mechanics by themselves can be really rewarding

- But it can also go wrong if they don't have enough knowledge to make the discovery themself
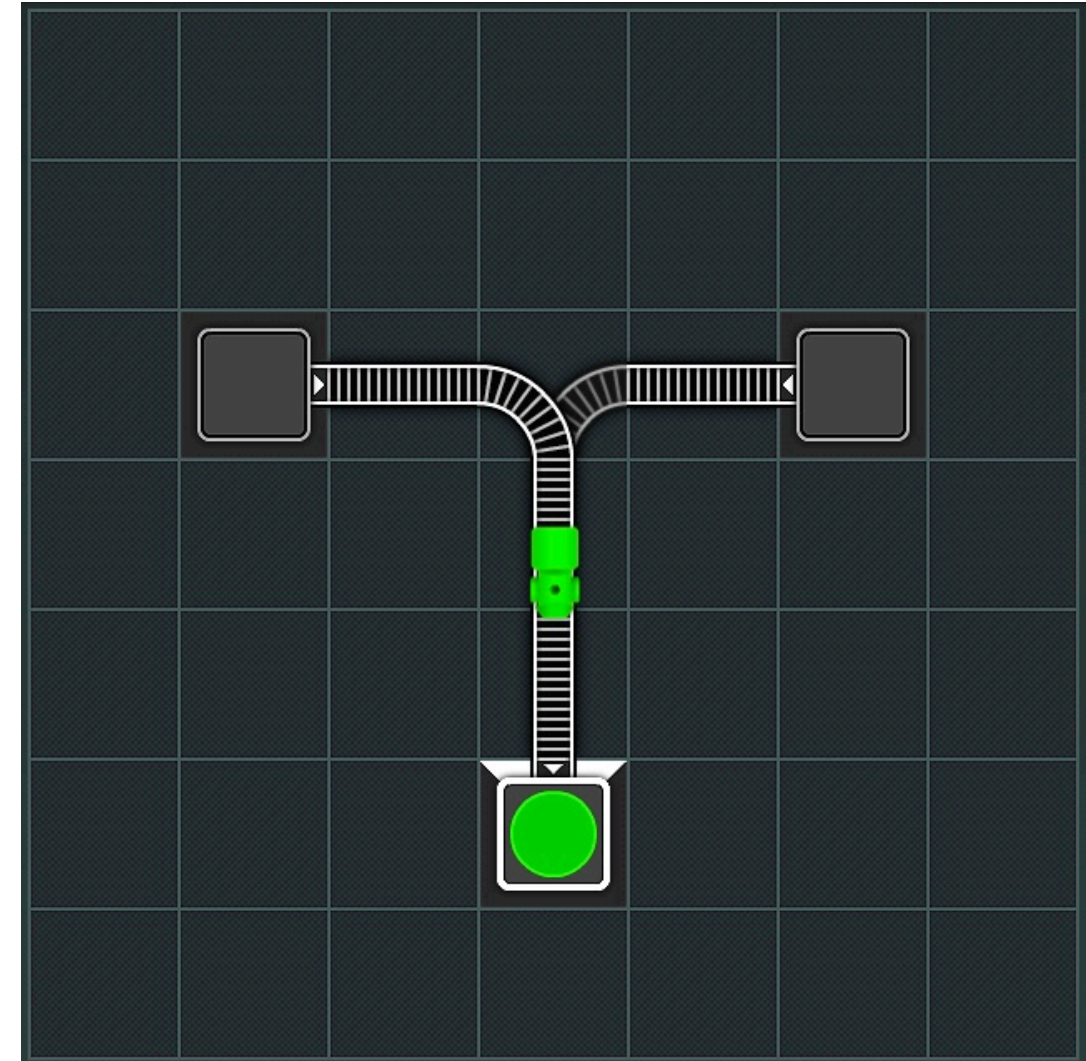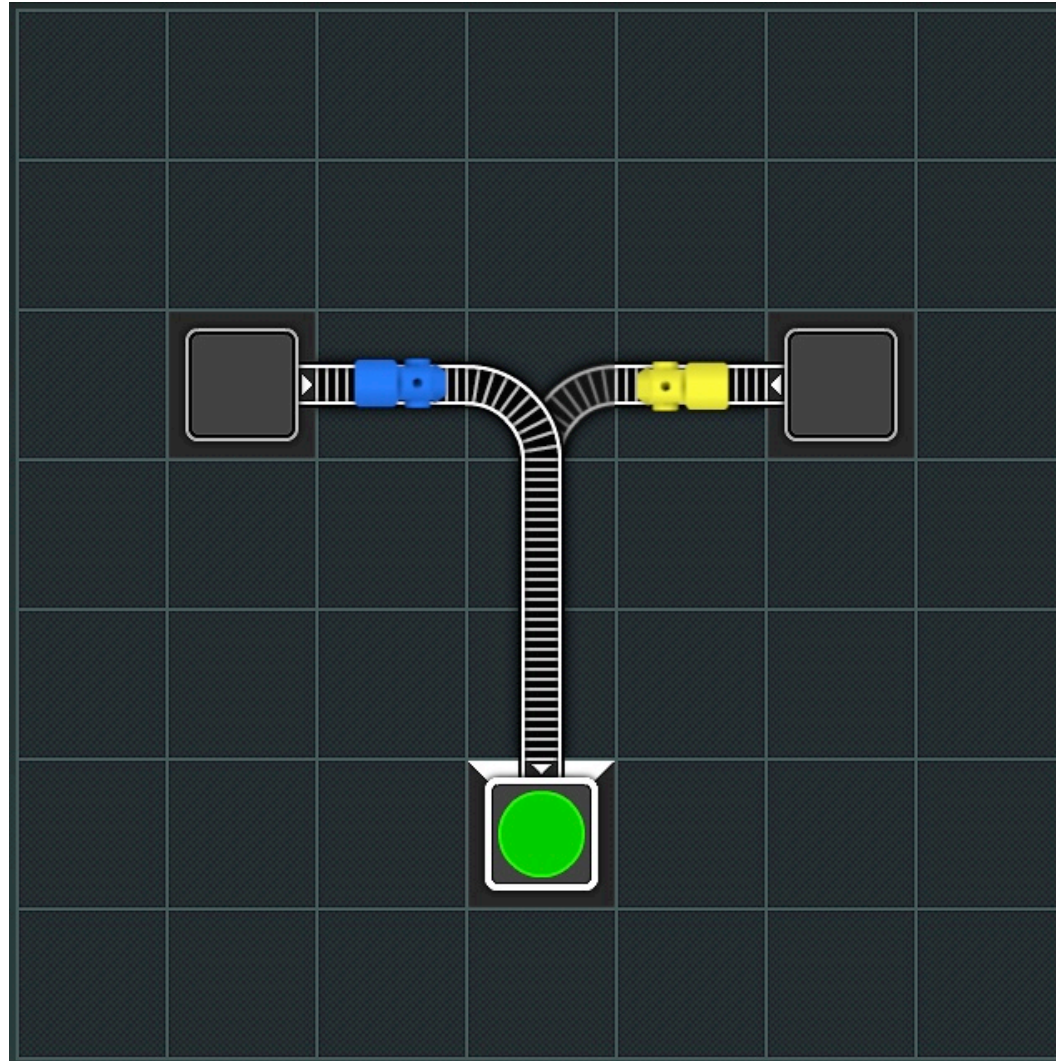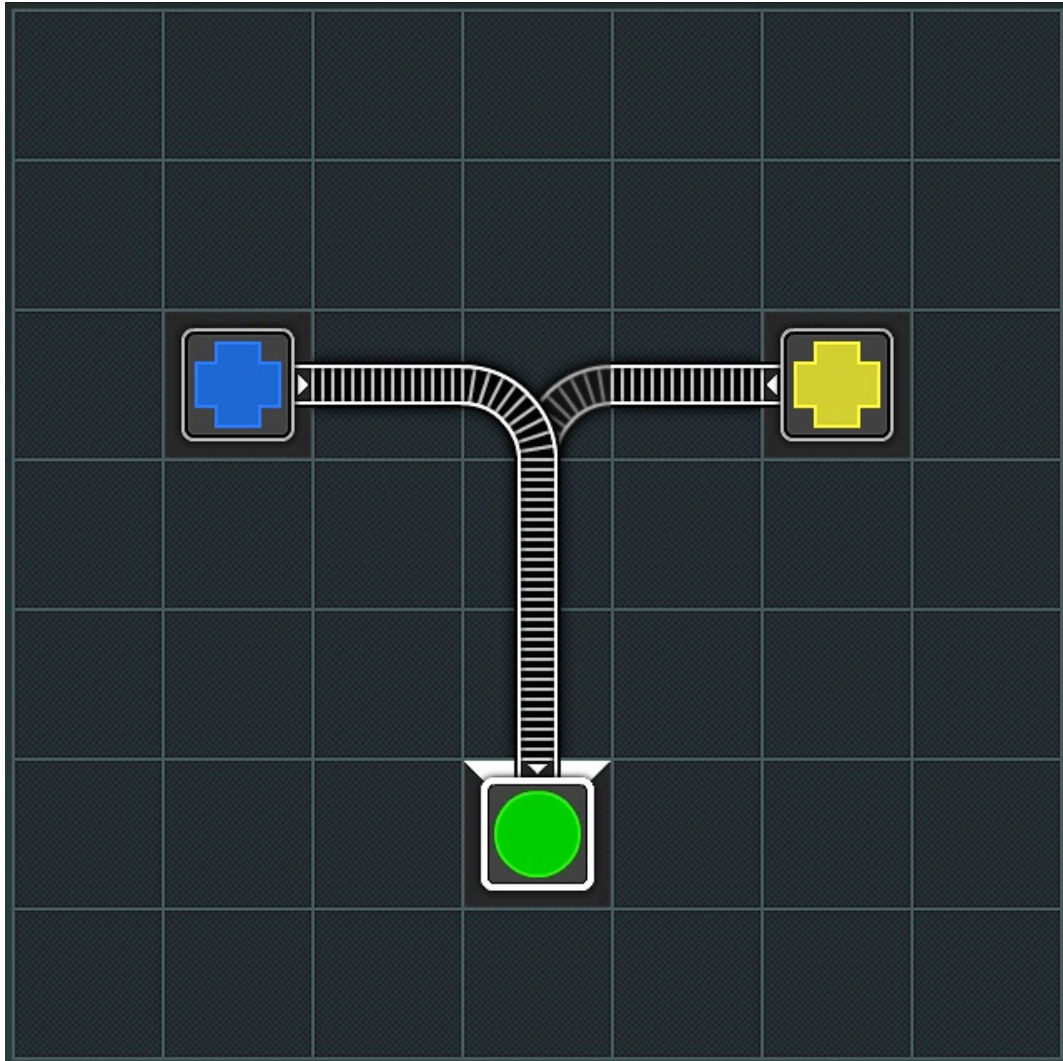
- Here's an example of discovering untaught mechanics
- This is a puzzle called "Colour Theory"
- Up to this point in the game, 32 puzzles in, there haven't been any puzzles that require the player to mix colours together.
- There is no tutorial before this puzzle to explain that mixing colours together is possible
- They just have to figure it out for themselves
- Something that the player discovers will stick with them even more than something they've been taught
- And it feels really good to make discoveries, many players have told me this is the point where they really started liking the game

Wrapping up

- So to wrap up

- I hope you've enjoyed learning about my general level design philosophy

- And about some of the issues I had throughout the creation of Trainyard

Thanks for listening

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magicule.com

- Thanks for listening

- Feel free to get in contact with me if you have any questions or comments.