

Gamifying Digital Art to Teach Basic Concepts in Adobe Photoshop and Illustrator

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Introduction:

Adobe Photoshop and Illustrator are the industry standard in the graphic design industry. They are hefty programs that are difficult to learn and can take years to master. When a student first opens the program, they are faced with an overwhelming amount of icons and windows, tools with an array of confusing features, and unfamiliar lingo. Without proper scaffolding, students struggle through assigned tasks, leading to frustration and decline in motivation. There is so much content in Adobe Illustrator and Photoshop, that students need appropriate levels of guidance as suggested by Vygotsky to successfully learn new content. (McLeod et al., 2023)

To create scaffolding and ease students into the program's overwhelming interface, I gamified Adobe Illustrator and Adobe Photoshop by creating interactive digital art pieces that bring learners into the zone of proximal development. Each file has instructions on how to interact with it, and as you complete each step, another set of instructions are revealed. Within this scaffolding, students are able to learn tools as they follow each step, and discover new clues to solve the mystery. I spent several hours on aesthetics, using the principles and elements of design to create high quality art pieces that show the possibilities of Illustrator and Photoshop, and the amazing things you can do with the program.

For Adobe Illustrator, I created an isometric world called “Quandryville” where each instructional activity is a lateral thinking puzzle. Each puzzle can be solved by following a series of steps that are provided in the program. For Adobe Photoshop, the student is a detective trying to solve crimes such as why the sheep are going missing. Each crime shows an interactive scene which eventually reveals that marmots are the root problem of each crime. Collectively, there are 8 puzzles, each with their own artwork, story line, instructions, steps, and solution.

Part 1: The Problem

As a graphic arts teacher, I am constantly helping students who get stuck and frustrated while learning Adobe Illustrator and Photoshop. It is common for graphic arts teachers to employ project-based learning as a tool for teaching these programs because of the freedom and autonomy it brings; however, without deep understanding of the tools the students are unable to complete any real projects of consequence - without some intervention. Most high school students do not understand the fundamental software tools, which hinders their ability to complete most projects on their own. The amount of content that they don't know is far greater than what they do know, placing them in a position where learning is much more difficult. They may have a clear vision of what they want to create, but knowing where to start and how to bring their vision to life is out of their range. There are many ways to bring students back into the zone of proximal development, but are any of them effective enough for today's classroom?

The most common and widely used method for teaching digital art is direct instruction. The teacher will provide a series of instructions, and students will practice what they learn through some sort of assignment or project. However, psychology experiments show that the short-term memory of an average person can only hold around 4-7 items, and learning a new software such as Photoshop and Illustrator require you to store more than 7 items in short-term

memory. Additionally, short-term memory is very fragile and information can be easily lost with a distraction, or just the simple passage of time (Cowan, 2010). With the vast amount of steps required to complete a project in Illustrator and Photoshop, a lecture is not an effective way of getting content across to students.

A strong alternative to direct instruction is using videos or articles which students can follow along at their own pace. Students can repeat and reread any information they forget or don't understand. In addition, through advanced searches online, students can find the solution to practically any problem they may run into. However, when students are first starting out in a program, it can be very overwhelming, and oftentimes, they don't even know what tutorials to look for. Additionally, videos are typically set up in a "watch and follow" format, so the immediate tasks often stay within the bounds of working memory, never being digested enough to move into long-term memory.

For the initial user, Adobe also has some in-app tutorials that can be helpful, as well as animated gifs for understanding the names and functions of each tool. For example, you can find tutorials on almost every tool in Illustrator. However, these tutorials lack excitement and intrigue. Many students lack the motivation to complete the tutorials, and they don't bother to use their problem solving skills to find answers.

Although there are many resources available, optimal learning conditions differ for each student, and many students are left behind depending on the type of instruction used. So what is the best way to teach Photoshop and Illustrator tools at a speed that everyone is comfortable with, that is easily remembered, and that is packaged in a fun and exciting form to motivate students? The simple answer - yet complex method - is gamification.

Gamification has emerged as a popular trend in recent years, and many teachers have started implementing gamification in the classroom. Teachers use strategies that are often found in video games such as progression through levels, unlocking powers, earning rewards, competing with classmates, and solving problems. Research has shown that gamification offers many benefits that can enhance student learning. It promotes engagement and motivation by transforming the learning process into a more interactive and immersive experience. It also facilitates personalized learning experiences for each type of learner, keeping quick learners and slow learners moving at their own pace (Dicheva et al., 2015).

There are a few games that exist for teaching graphic arts skills. One popular game is the Bezier game, which teaches users how to use the pen tool in Adobe Illustrator. Players must create lines and curves in the least amount of steps possible, as they trace a series of increasingly difficult shapes. However, these games are separate from the actual program, and it can be difficult to apply what is learned from the game into the actual program, and the tool doesn't act in the same way that it does in Illustrator. For example, you can click on an anchor while using the pen tool to make it into a corner in the program, but you can't do that in the game. It also doesn't cover where to find the tool, how to change the stroke color if your lines aren't showing up, and how to adjust lines that you have already created. Playing the Bezier game isn't enough

for mastering the tool. However, the concept of the game is strong, and the potential to create something even greater began to shape the idea for my own project.

Part 2: Ideation

Use the strength of current solutions



Figure 1: Youtube, in-app instructions, and the Bezier game combined to create a solution

The current instruction solutions for beginner graphic arts students are somewhat effective, but due to the diversity of learners, it may inadvertently leave some students struggling to grasp many of the basic concepts. In addition, they are minimally effective at motivating students when you discount any external motivators such as grades. However, they all have specific strengths that could be combined to create a new solution (see figure 1). I wanted something that had the in-depth instruction and variety found in Youtube videos, the in-app strengths of learning in the program, and the gamification of the Bezier game.

I first started thinking about how I could improve the already existing Bezier Game. One problem that it poses is that if someone is good at the Bezier game, it doesn't necessarily mean they will be good at the pen tool. Since it's not learned in Adobe Illustrator, many students can't even figure out how to find the pen tool on the side toolbar, let alone use it properly and usefully. I eliminated the gap by creating the instructions and game in Adobe Illustrator.

One of the qualities of a good game is the use of autonomy and mastery to increase motivation. The bezier game involves a nice balance of autonomy as you choose the path you create, and mastery by giving small bits of instruction as level difficulty increases. Upon completion, the game will give you a score based on how efficiently you used the pen tool.

Students are motivated to get the lowest score possible, and may even try the game multiple times to decrease their score.

I considered other ways to motivate students that would provide the same amount of satisfaction upon completion. I thought about Paint By Numbers and Jigsaw puzzles, and the joy of watching a picture come to life. I decided it could be fun to have a picture be revealed as the student completed the task of tracing with the pen tool. I created three layers with the bottom layer being a gray line that students have to trace, and the top layer has white details that only show up if you put a colored fill on your shape (see figure 2).



Figure 2: (left) incomplete image of untraced image. (right) completed traced image with a pink fill color. White shapes only show after tracing the image correctly.

Once I discovered the potential of pictures being revealed upon completion of a certain task, I realized that there are other ways to reveal hidden secrets and both Photoshop and Illustrator would be great platforms for gamification. I could use the platform to create much more elaborate and interesting games than my original “pen tool game”. Thinking back on the games I played during my own childhood, I have fond memories of Her Interactive’s “Nancy Drew” games. It always started with some sort of crime, and you explore a world and find clues to solve the mystery. I began to take advantage of the infinite zoom of Illustrator, and the ability to hide objects outside of the artboard in Photoshop, and I continued to think of many other ways to hide clues and instructions that make a piece of art interactive. An art piece with hidden clues could turn into a mystery game where you explore the piece and slowly discover the solution to a puzzle. My ideas became more elaborate, and so did my artwork. I began to close in on a solid idea, and I started the development of my first game.

Part 3: Development

I began development of my first game in Adobe Illustrator. Like any good mystery game, there needs to be some sort of puzzle or crime. Initially, I had a hard time coming up with an

intriguing idea or riddle, so I decided to use some lateral thinking puzzles that already existed. A lateral thinking puzzle is a type of riddle or problem-solving activity designed to challenge conventional thinking and encourage creative, "outside-the-box" solutions. Unlike traditional puzzles that rely on logical deduction, lateral thinking puzzles require individuals to approach the problem from unconventional angles, exploring different possibilities and considering imaginative solutions. These puzzles often involve scenarios that seem paradoxical or absurd at first, prompting participants to think laterally and break free from the constraints of linear reasoning. They are excellent tools to stimulate creativity, enhance problem-solving skills, and encourage innovative approaches to tackling complex challenges (Bono, 1992).

The first puzzle that I developed was the bankruptcy mystery in Adobe Illustrator. The riddle goes like this: "A man pushes his car until he reaches a hotel. When he arrives, he goes bankrupt. What happened?". I wanted to create a scene that looks like a normal street with a hotel, but slowly turns into a Monopoly board as the user learns the selection tool, and changes colors of shapes. I used the isometric style because I felt it best portrayed the street, and it's a fairly easy style that can include a lot of detail. My first rendition was pretty basic, and didn't include a lot of detail. However, it got my initial idea across, and I began to improve and develop a much more refined version.

The Illustrator puzzles always start out with the same opening with the puzzle stated, and instructions to delete the top instructions with the selection tool to reveal the scene. Figure 3 shows the initial instructions that appear when you first open the Illustrator document. If the students correctly follow instructions and use the selection tool and delete those instructions, the next scene will appear (Figure 4).

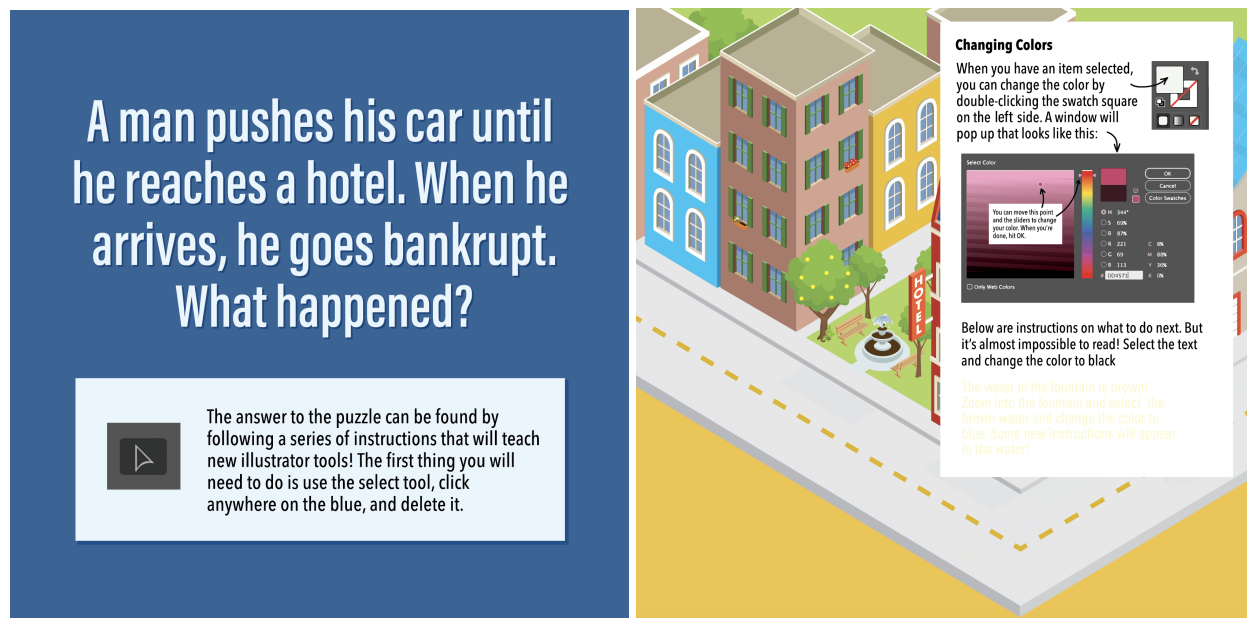


Figure 3: The first image seen when initially starting the puzzle game

Figure 4: The scene that is revealed upon deletion of the blue instructions.

Instructions are always revealed slowly so as not to overwhelm the student. Figure 4 includes instructions on how to change colors of objects. A simple challenge is given to change the text color from to black, so the next clue can be revealed. From there, instructions slowly increase in difficulty, and students are given plenty of practice to engrain previous knowledge of selecting objects and changing colors. Figure 5 shows the scene after changing the fountain water from brown to blue, and selecting multiple apples and changing the color from yellow to red. The instructions are so small that students have to know how to zoom in to read the text.



Figure 5: Scene of partially solved puzzle of the bankrupt man pushing a car.

Once students learn to select multiple items at once using shift, they are challenged with the concept of selecting a number of items so large that it would take too long to select them individually. They are challenged to select all of the yellow lines in the middle of the road. But an additional tip is included, explaining how to select multiple items that have similar attributes

such as the same color. By providing the need for a tool first, then explaining the tool that fulfills that need, students are more likely to understand the benefits of the tool.

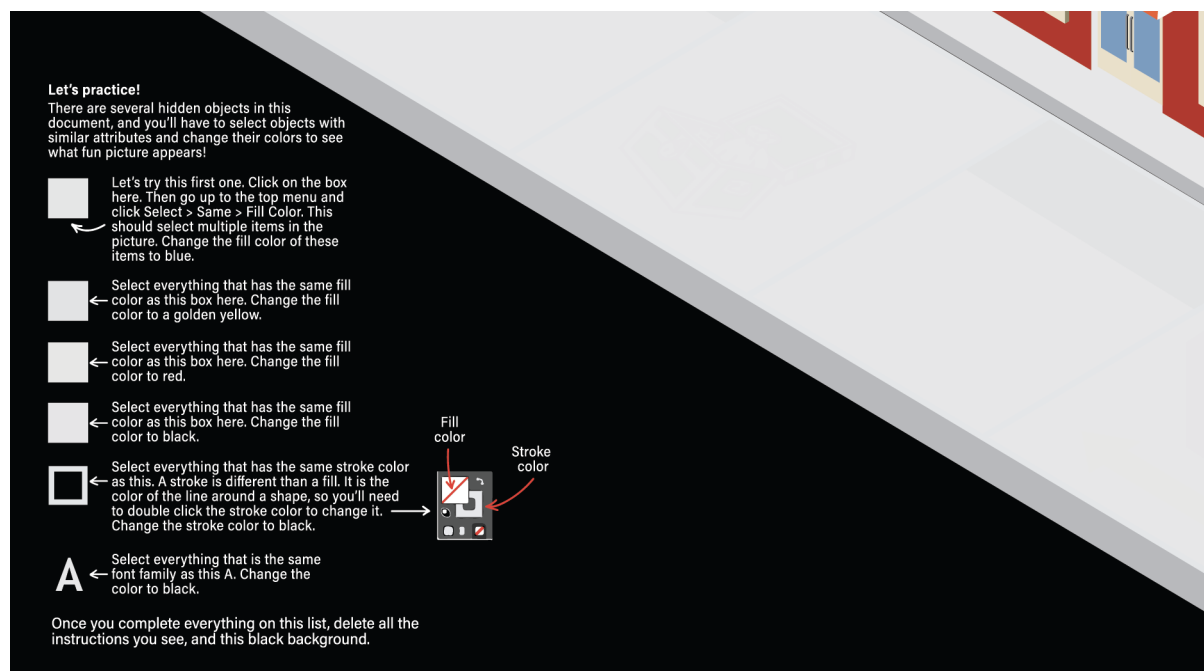


Figure 6: Zoomed into the bottom left of the puzzle, the last set of instructions are revealed.

Nearing the end of the puzzle, students have the opportunity to practice all of the skills they learned (Figure 6). These last set of instructions are only revealed after completing all of the previous clues. Each square is a slightly different color, and as similar colored items are selected and changed, a new picture starts to appear.

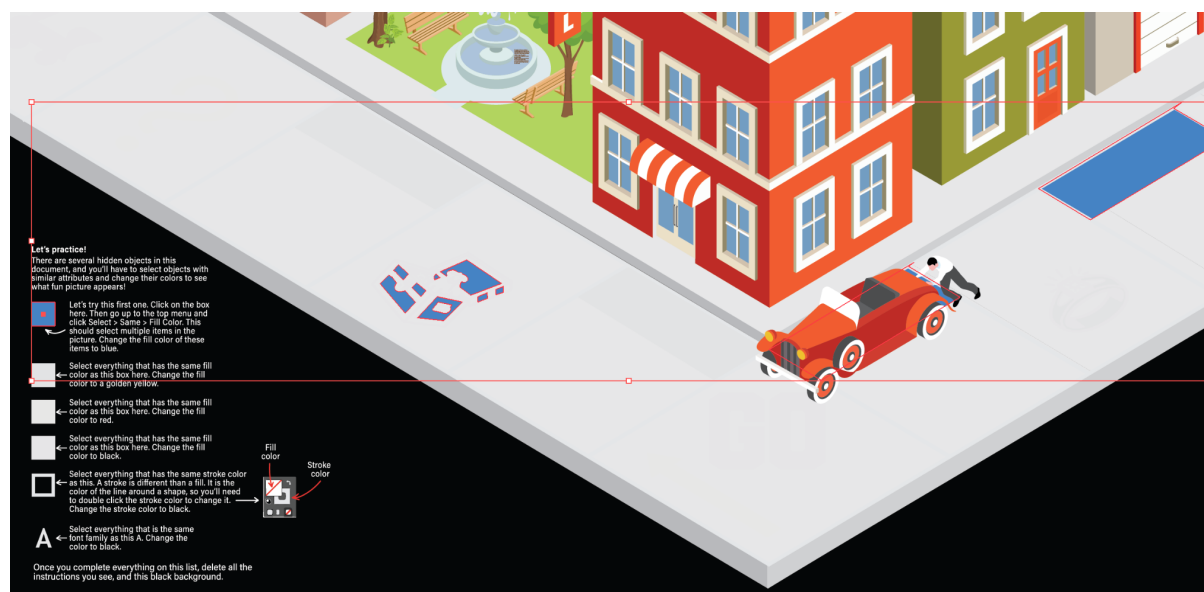


Figure 7: Selecting the same fill color as the first square and changing it to blue

Finally, as every set of instructions is complete, the answer to the puzzle is revealed. The man goes bankrupt from pushing his car to a hotel because he's actually playing Monopoly! (See Figure 8.)



Figure 8: The final scene of the completed puzzle

From there I started developing my second puzzle that taught the direct select tool in Illustrator using the following lateral thinking puzzle: “Three kids enter a room, but only two walk out. The room is empty. Where is the third kid?”. I used the same isometric style and created an indoor kitchen scene. Using the direct selection tool, the scene slowly changes and reveals new clues and instructions over time. It was after completing these first two puzzles that I

began testing, which involved rigorous design based research as I continually evolved the puzzles to better meet the needs of students. More information on testing is provided in Part 4.

Creating puzzles in Illustrator was fairly easy. There were plenty of ways to hide things, and the infinite zoom made it easy to hide hints all over the artboard. As I began to think about how I could transfer these same ideas over to Photoshop, I was feeling daunted by the task ahead.

I decided to use simple mysteries rather than lateral thinking puzzles for the Photoshop files. I knew the style was going to be realistic, with a mesh of several photos to create the scene. The first mystery was fairly basic: “Why are the sheep on Mrs. McGoo’s farm going missing?”. With that, I chose a culprit that would be both goofy and out-of-the-box: marmots.

Photoshop is interesting in that the default setting will hide anything outside of the artboard, whereas Illustrator will show objects that are outside of the artboard. This was useful, because I could create entire scenes that were hidden until a small object was moved. I also took advantage of the layers panel and the ability to hide and unhide layers. Eventually, I developed an intricate scene that changed over time to eventually reveal marmots knitting hundreds of sweaters beneath the farm.

After a quick round of testing on my students, I developed the rest of the puzzles and completed a total of 4 Photoshop and 4 Illustrator files.

Part 4: Testing

I conducted two rounds of testing for all 8 of my products. For my test group, I chose a wide variety of people including high school students, college students, young kids, and older people. I wanted a wide range of skill levels and ages so I could catch all types of problems or confusing steps. For example, the violin maker has an acute attention to detail, whereas the english teacher will catch any grammatical errors. An older person may interact with a computer differently than a younger person, and so on.

Round 1 testers:

- 26 High School Graphic Arts Students (Ages 15-18, experience level: Beginner)
- Paula Spencer (Age 56, Compliance Officer, Experience level: Beginner)
- John Nelson (Age 26, Graphic Design Student, Experience level: Advanced)

Round 2 testers:

- Finn Spencer (Age 8, Video game enthusiast, Experience level: Beginner)
- Josie Rivera (Age 26, English Teacher, Experience level: Beginner)
- Sue Nelson (Age 58, Life Coach, Experience level: Beginner)
- Mary Bevan (Age 37, Lawyer, Experience level: Beginner)
- Lizzie Spencer (Age 30, Statistician, Experience level: Beginner)
- Ally Mauldin (Age 28, Data Scientist, Experience level: Beginner)
- Jordan Hess (Age 28, Violin Maker, Experience level: Intermediate)

- Julie Webb (Age 34, Graphic Designer, Experience level: Expert)

I had some people complete these puzzles on their own, and I also watched some people complete it and observe any parts where they had difficulties. I collected qualitative data through interview questions and observation (see Appendix A for testing feedback) and began to look at attitudes towards the games. I asked questions to determine if they enjoyed it, what they found frustrating, what they learned, and any confusing steps they encountered along the way. I used design based research and took these results to go back and improve my product until I have desirable results (see Figure 9).

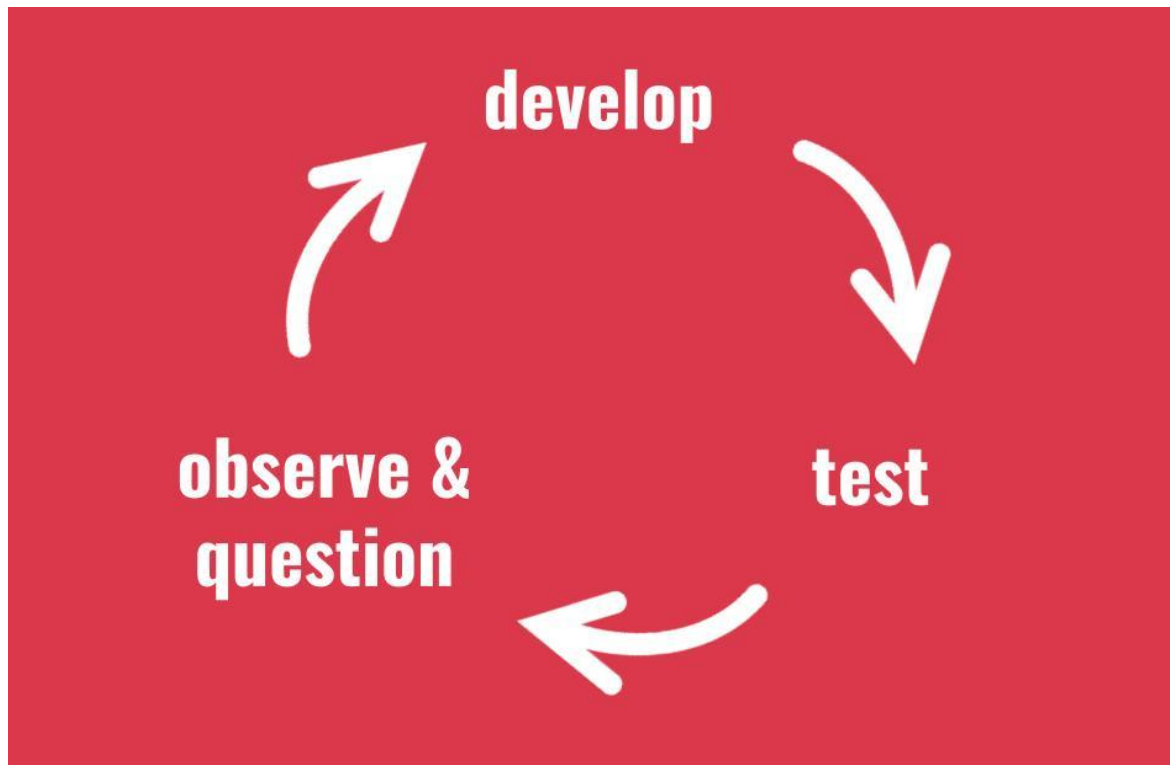


Figure 9: Model used to improve upon existing puzzles

The overwhelming majority of the feedback I received was positive. It didn't matter if it was a high school student that was required to complete it for a grade, or an expert graphic designer that already knew all of the tools. Everyone had fun solving these puzzles, and they were excited to learn more. However, several issues were found, whether it was confusing instructions, or missing steps. From the feedback I received, I was able to perfect the files and make them ready for the classroom.

Part 5: Conclusion

In the end, I created 8 puzzles total which cover some of the most basic tools in Photoshop and Illustrator. Each of these puzzles can be completed in an order that builds upon

one another, and they can be used without any additional instruction. To better illustrate the power of each of these puzzles, I created videos for each of the 8 files. Below I provide a short description and a link to the videos.

Photoshop: I Spy

This is a super fun I Spy Photoshop file that can be used on day 1 to get students comfortable with navigating the program. Students will have the chance to practice zooming, panning, and using the move tool as they explore this highly detailed Photoshop file. There are almost 100 layers of objects, many of which have been edited so they blend in to increase difficulty. Behind each item that is found on the list, there is a letter which spells out a secret code.

<https://vimeo.com/853448277>

Photoshop: Mystery of the Missing Painting

Several paintings at the museum are going missing! Find the solution to the mystery by following a series of steps in an interactive Photoshop file that teaches the marquee and lasso tools. As you delete selected sections, a secret code will be revealed that will lead to the solution to the puzzle! At the end, there is a bonus step that teaches how to copy and paste selections as well. All of the instructions are provided in the file and are slowly revealed as they complete each step. This is a great activity to use for the first couple days of Adobe Photoshop. This activity will take students anywhere from 15-20 minutes.

<https://vimeo.com/853442515>

Photoshop: Mystery of the Missing Sheep

The sheep on Mrs. McGoo's farm are going missing! Find the solution to the mystery by following a series of steps in an interactive Photoshop file that teaches the basics of the layers panel in Adobe Photoshop. As you move objects, see and unsee layers, zoom, and pan, you will follow a series of clues and find out who is stealing all of the sheep! All of the instructions are provided in the file and are slowly revealed as they complete each step. This is a great activity to use for the first couple days of Adobe Photoshop. This activity will take students anywhere from 5-10 minutes.

<https://vimeo.com/853448920>

Photoshop: The Marmot Mystery

In this file, students will learn how to remove backgrounds from several different pictures of marmots to find out what sinister plan they're up to. Students will learn how to remove backgrounds using the properties panel, how to edit the background removal tool using the brush tool on the mask, rasterizing a smart object layer, and how to unlock a layer. This activity takes around 15 minutes to complete.

<https://vimeo.com/853440442>

Illustrator: The Mysterious Extra Egg

There are a dozen Easter eggs in a carton. All twelve eggs get hidden throughout the neighborhood, but there is still one egg left in the carton. How? This is an interactive Adobe Illustrator file that teaches the basics of Adobe Illustrator as you solve a puzzle! Through this file, learners can begin to understand the basics of navigating Illustrator on their own. They will practice zooming, panning, selecting, and resizing (evenly with shift and unevenly). They will learn these tools as they solve the lateral thinking puzzle of why there's an extra egg in the carton. All of the instructions are provided in the file and are slowly revealed as they complete each step. This is a great first day activity that will take students anywhere from 10-15 minutes.

<https://vimeo.com/853448057>

Illustrator: The Bankruptcy Puzzle

A man pushes his car to a hotel and goes bankrupt! Find the solution to the puzzle by following a series of steps in an interactive Illustrator file that teaches the many ways of selecting multiple items, as well as how to change the fill and stroke colors of shapes. As you move objects, zoom, select, and change colors, the picture will change and you will find out why the man went bankrupt! All of the instructions are provided in the file and are slowly revealed as you complete each step. This is a great activity that will improve student workflow. It will take students anywhere from 15-20 minutes.

<https://vimeo.com/853449278>

Illustrator: The Disappearing Child

Three kids enter a room. When dinner is ready, only two walk out. The room is empty. Where is the third kid? This Illustrator file teaches the difference between the selection tool, and the direct selection tool. Students will learn how to move points using the direct selection tool, and how to curve corners. As each step is followed, you will solve the mystery of how the third child seems to disappear. This activity will take 5-10 minutes.

<https://vimeo.com/853447833>

Illustrator: The Great Panic of Brian's Snoring

Brian's snoring is usually just annoying. Today it causes terror and panic among dozens of people. Why? This Illustrator file helps students learn how to arrange the order of items on an artboard, and how to rotate objects. As they move items forward and backward, different clues will be revealed, and a new scene will emerge that will explain the panic of dozens of people. This activity will take 5-10 minutes.

<https://vimeo.com/853447589>

The success and feedback for this project has been overwhelming. I've shared it with a significant number of graphic arts teachers, and they are looking forward to using it in their classrooms. I'm excited to continue sharing these useful teaching tools that can be used by graphic arts teachers, photography teachers, college-level professors, and personal continuing education for any age. They will be great tools in increasing engagement in the classroom, and introducing beginner students to Adobe Illustrator and Photoshop.

Previously, outside sources and games have been used to create instructional content for teaching Adobe Illustrator and Photoshop. But through my research, exploration, and creation, I have opened up a whole new idea of using Adobe Photoshop and Illustrator as the platforms to create puzzles and games. My interactive files are innovative and inspiring, and they have the potential to completely remake graphic arts teaching. Through the information I have learned with this project, I look forward to continually exploring the possibilities with these programs and creating new instructional games.

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Appendix A

First Round of Testing Feedback:

Photoshop: I Spy

- The majority of people thought that the I Spy puzzle felt incomplete. There needed to be more stuff, more hidden objects, more furniture, and less carpet. Things were fairly easy to find because there wasn't enough distraction.

Photoshop: Mystery of the Missing Painting

- The marquee and lasso tools aren't just for deleting content, it can also be used to copy and paste sections. There should be an additional section with some copy and paste challenges.

Photoshop: Mystery of the Missing Sheep

- Overall, it just needs more steps. The puzzle should take at least 10 minutes. I'll add layer moving steps, and a few zooming and panning challenges. I also need to lock the tree and provide steps to unlocking it so it can't be accidentally moved.

Photoshop: The Marmot Mystery

- This puzzle was completed too quickly, add more steps and repetition for practice!
- The steps need to be numbered so it's not just an overwhelming paragraph of instructions. Chunking the steps can make it a lot easier to follow.

Illustrator: The Mysterious Extra Egg

- I need to provide some sort of "Congratulations" at the end of the puzzle so people know when they have solved it.
- Another issue someone ran into is there are two green polka-dot eggs, so knowing which one to move can be confusing.

Illustrator: The Bankruptcy Puzzle

- I need to provide some sort of "Congratulations" at the end of the puzzle so people know when they have solved it
- With instructions appearing on a yellow background, depending on which yellow is picked, the text is unreadable.
- The instructions for changing colors was confusing
- Some students clicked on the background, not the small box to change colors.

Illustrator: The Disappearing Child

- I need to provide some sort of "Congratulations" at the end of the puzzle so people know when they have solved it
- Curving the corners on the pizza was confusing because of the crust
- Dots on the table weren't seen by most students: maybe make the tablecloth spread to the edge of the table instead.

Illustrator: The Great Panic of Brian's Snoring

- The puzzle needs more steps, and more repetition and practice with arranging objects.

Second Round of Testing Feedback:

Photoshop: I Spy

- Maybe it would be best to provide the instructions in the file, so teachers could choose to use it and students could do it on their own, or they could delete the instructions and do an in-class use of the file.

Photoshop: Mystery of the Missing Painting

- Step two it was difficult to find the elliptical marquee tool. Maybe explain how to find it!
- The text at the end behind the paintings can be hard to read.
- Layer 6 was already unlocked, make sure that's unlocked.

Photoshop: Mystery of the Missing Sheep

- The dog is a little bit too small... It's super hard to find!

Photoshop: The Marmot Mystery

- This needs a picture of the brush tool on marmot 4 instructions
- Marmot 4 instructions has a typo
- Those pesky marmots. Why are they up to so many shenanigans!?
- Grass layer, I don't say that you have to remove the background after rasterizing the smart object
- Unsee layer 8 and 9... check that out see if it's correct

Illustrator: The Mysterious Extra Egg

- To press "delete" was a confusing step. Instead, change the wording to "press backspace or delete on the keyboard"
- There are two green polka-dot eggs
- The egg carton looks weird when you pull it apart... Improve the look of that
- It wasn't super clear when it was done

Illustrator: The Bankruptcy Puzzle

- The stroke color changing was confusing
- "Click the white background" was confusing, because there are several shades of white all over.
- There needs to be extra explanation or numbering on selecting the apples
- The color instructions say it's on the right side? Maybe?

Illustrator: The Disappearing Child

- The direct selection tool can be frustrating to learn... if you click directly on the point, you can move it, but if you click on the entire object first, it will move the entire object when you try to move a singular point. Maybe explain that in the instructions.

Illustrator: The Great Panic of Brian's Snoring

- It's hard to rotate when I hover over the corner, I can't seem to figure out how to do it.