

Cybersecurity Training for Youth Using Minecraft: A Field Guide

September 2019



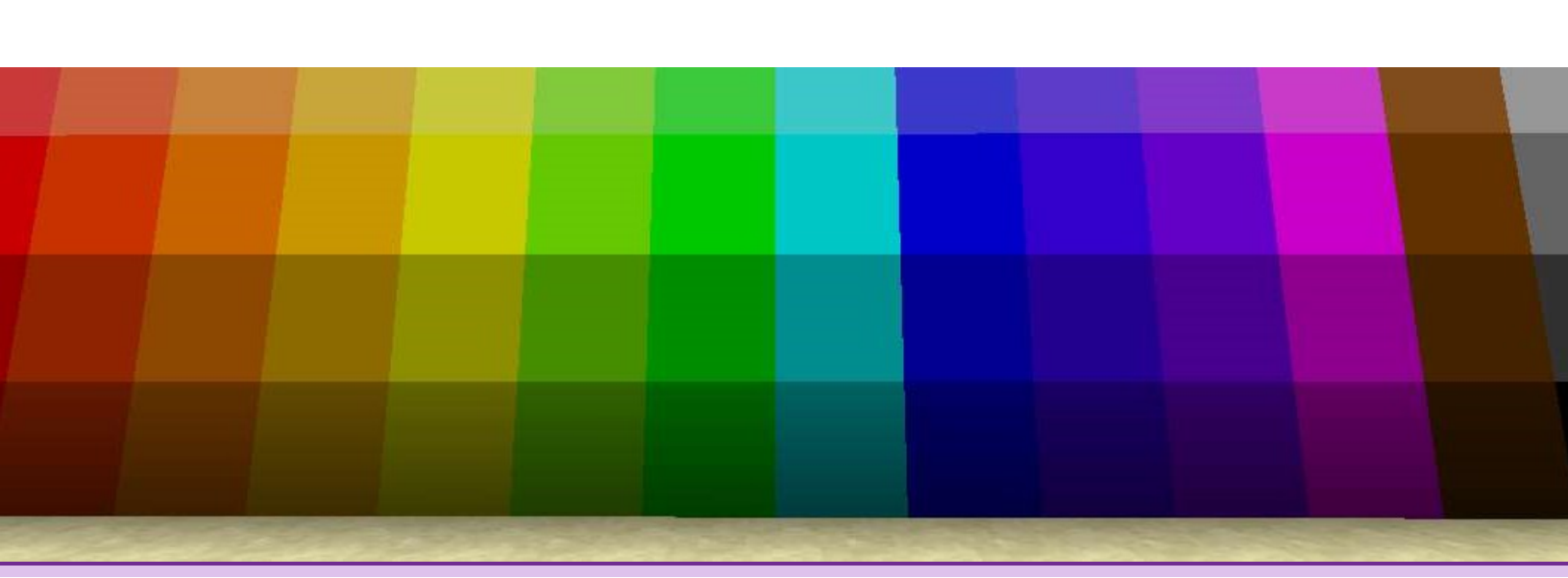
Pacific Library Partnership

Empowering Bay Area member libraries through innovation, collaboration, and training

This project was supported in whole or in part by the U.S. Institute of Museum and Library Services under the provisions of the Library Services and Technology Act, administered in California by the State Librarian. The opinions expressed herein do not necessarily reflect the position or policy of the U.S. Institute of Museum and Library Services or the California State Library, and no official endorsement by the U.S. Institute of Museum and Library Services or the California State Library should be inferred.

TABLE OF CONTENTS

INTRODUCTION	3
MINECRAFT IN LIBRARIES	6
<i>Background</i>	6
<i>About the Project</i>	6
<i>Project Lead</i>	7
WHAT IS MINECRAFT.....	8
TEACHING WITH MINECRAFT VS. TEACHING IN MINECRAFT	9
<i>Feature 1: Coaching</i>	9
<i>Feature 2: Self-Explanation</i>	10
<i>Feature 3: Pretraining</i>	10
<i>Feature 4: Modality</i>	10
<i>Feature 5: Personalization</i>	10
BUT IS IT WORTH IT	11
MINECRAFT MODES	11
<i>Mode 1: Social Emotional Learning (SEL)</i>	12
<i>Mode 2: Artistic Expression</i>	12
<i>Mode 3: Code School</i>	13
<i>Mode 4: MetaMinecraft</i>	13
IS MINECRAFT RIGHT FOR YOUR LIBRARY.....	14
FREQUENTLY ASKED QUESTIONS	14
SELECTED BIBLIOGRAPHY	17
ADDITIONAL ONLINE RESOURCES	18
 LESSON PREPARATION	 19
PREPARING FOR YOUR MINECRAFT WORKSHOP.....	21
<i>Part A: Wood Axe</i>	21
<i>Part B: Iron Sword</i>	22
<i>Part C: Diamond Pickaxe</i>	23
<i>Part D: Enchantment Table</i>	24
<i>Part E: Extra Credit</i>	24
 LESSON PLAN	 25
<i>BUILDING BETTER BASES</i> CYBERSECURITY LESSON	27
<i>BUILDING BETTER BASES</i> OUTLINE	29
<i>BUILDING BETTER BASES</i> SLIDES.....	33
<i>BUILDING BETTER BASES</i> HANDOUT	45
 STUDENT PLAN	 47
<i>THE DIGITAL FORTRESS: SELF-GUIDED LESSON</i>	49



Introduction

Cybersecurity Training for Youth Using Minecraft: A Field Guide

Developed as part of an LSTA Statewide Grant led by the Pacific Library Partnership

September 2019

Minecraft in Libraries

Background

According to a recent Pew Report, 49% of parents talk to their school-age children about what is appropriate to view online, but they do not necessarily talk with them about security regarding passwords, data protection or phishing. High school teens spend a weekday average of 2.3 hours online and 4.3 hours per day online on weekends, which leaves them vulnerable to cybersecurity threats. Common Sense Media recently released a report indicating tweens (8- to 12-year olds) use an average of about six hours' worth of entertainment media daily, which has been increasingly shifting away from TV towards online activities. Some research has been done to assess youth trust in online environments, but very few resources have been developed for youth regarding Cybersecurity. The Department of Homeland Security created a resource guide focusing on print material entitled "Stop. Think. Connect." to promote safe cyber behavior in teens in corporate environments (for example, how to spot a Phishing email). In 2017 Google released their "Be Internet Awesome" gaming website targeting children below the age of ten and functioning like a storybook a parent might share with their child.

Because of sparse set of resources to help youth learn about cybersecurity, the Pacific Library Partnership (PLP) applied for and received the Library Services and Technology Act (LSTA) grant *Cybersecurity Training for Youth Using Minecraft*. With the grant, we have developed a resource which uses gamification to teach cybersecurity to youth through the creation of an interactive, vendor neutral cybersecurity learning platform in the videogame Minecraft.

About the Project

Minecraft is the second most popular videogame in history. Its premise is to take blocks and build objects and environments to go on adventures. Objects and adventures that people build can be used by them or shared with others. There are communities that build educational adventures for Minecraft. Minecraft Education Edition (MEE) is one such community currently used internationally by educators in grades K-12 to teach a range of subjects, and hosts an online repository of lessons plans that map directly to specific learning outcomes and curriculum standards in the United States and abroad.

This toolkit is designed to teach librarians how to use MEE to build a cybersecurity learning platform for youth. The open playstyle of Minecraft will allow us to build an adventure using meaningful cybersecurity metaphors that youth will remember and understand. For example, Minecraft players who use survival mode have to make decisions that impact the health and safety of their in-game character and resources—in order to progress through the game they must actively assess their surroundings and avoid threats. This is not unlike how internet users are tasked with protecting their online privacy by choosing to use one website or social media platform over another and develop a password management strategy that is resistant to data breaches. Building walls and forts also plays an important role in Minecraft, and through design thinking exercises students will learn how to evaluate the effectiveness of their in-game defenses in the same way an internet user at home needs to understand the limitations of their cable internet ISP's firewall.

Participants will learn 4 key things: network security basics such as password protection; how to identify outside threats such as phishing; data protection; and social engineering.

This toolkit includes best practices, a set-up guide for public computer labs and lesson plans. It was developed based on results of a survey sent to PLP libraries to understand their cybersecurity needs regarding youth, which helped shape the modules. Focus groups of teens, and work with several PLP libraries also helped to shape the tools you will find in the toolkit.

Project Lead

The Palo Alto Library staff were the lead on this project. As Minecraft enthusiasts, they are active participants in the Minecraft Global Mentor Program and had the vision to use the Minecraft Education Edition to build out a cybersecurity module.

Chris Markman, Senior Librarian at Palo Alto City Library led the project. Chris has been an avid video game enthusiast most of his life, and started playing Minecraft in 2014, a few years after finishing his library degree at Simmons College in Boston, Massachusetts. He is a fan, but not a “fanatic” of the game. It was around this same time he began to seriously study cybersecurity as an extension of librarianship and conducted cybersecurity risk management fieldwork for a public library while attending Clark University in Worcester, Massachusetts.

What is Minecraft?

Minecraft is the quintessential example of a growing genre of video games called survival sandbox. They are survival based because your game character is constantly under threat from their environment, and hungry. Farming for food is a common element. And sandbox because your character also has the power to modify their environment, building shelter to sleep in and tools to speed up that process along the way.

It is both a single player experience that can be enjoyed on mobile, desktop, and video game consoles, and a multiplayer game where hundreds of players can connect to the same server simultaneously.

If you have never played *Minecraft*, the most important thing to know is that there is no “finish line” for players. Yes, there are worlds or events that act similarly, but the game doesn’t stop there. It is much more about the *journey* than the *goal*, and the content of the game, after 10+ years of ongoing software development is so dense that fans have spent countless hours building online wikis and other knowledge bases to help other players along.

This “*Minecraft* mentality” resulting from the survival sandbox genre coupled with an encyclopedia of game knowledge to master is very similar to how libraries aim to create *lifelong learners*. There is always something new to explore in the world of *Minecraft*. Naturally, the education world quickly recognized the utility *Minecraft* could have in classrooms and began to build lesson plans and tutorial guides for teachers to leverage the game as early as 2013.

Minecraft is the second bestselling videogame of all time and has been the most popular video game viewed on YouTube for several years now. To put that in perspective, in terms of sales figures, it’s right behind the #1 video game of all time, *Tetris*, and shows no sign of stopping. Microsoft, after purchasing the game from indie developer Mojang in 2014 has invested heavily in the product. *Minecraft* is here to stay.

Teaching *with* Minecraft vs. Teaching *in* Minecraft

I know what you're probably thinking. For anyone who experienced the "edutainment" era of 1990s CD-ROM software and pre-internet PCs, the thought of video games teaching anything of value might seem like a stretch of the imagination.

Back in the day, a lot of time was wasted in front of computer screens in the name of "education." This is unfortunate because the tools were right there in front of us, but they were so new that very few educators knew how to leverage them effectively. Chris Markman recalls computer classes where he and his fourth grade classmates were *entranced* by the 8-bit graphics of *Oregon Trail*, but no one ever stopped to think hey, maybe if we shifted our thinking a little bit, this game could be the basis for something more than killing time before recess.

Before jumping in game-enhanced learning, it's important to consider how it compares to other modes of eLearning. One of the biggest weaknesses in *Minecraft* based lesson plans is the ability of the instructor to "speak *Minecraft*" with students and draw parallels between the game world and reality. This is the difference of teaching *in* the game versus teaching *with* the game. Clark and Mayer suggest there are five "promising features" that computer games offer over traditional eLearning modes: coaching, self-explanation, pretraining, modality and personalization. Fully utilizing these elements are in many ways the "secret sauce" of game-based instruction.

As you read through this list of features, try to think of the video game (or board game) that you're most familiar with. Note that each feature is *less* about the specific game itself, and *more* about how student and teacher communicate their understanding of different concepts *through* the game.

Feature #1 – Coaching

Your ability to provide "over the shoulder" advice before or after students (or a group of students) make a move or implement an idea can create a positive feedback loop for the entire class. Highlighting novel approaches as a way to spark new ideas and generate discussion topics organically.

Coaching can also take place before gameplay even begins, in the same way sports team might review a video recording of their competitor, you can use this time to draw out key elements to return to at the end of class.

Feature #2 - Self-Explanation

This evidence-based principle suggests that memory retention is enhanced when the “flow” of gameplay is maintained. When compared to control groups that were asked to type out their reasoning while using a video game enhanced learning module, the test groups that minimized disruption during gameplay performed better than their peers.

Feature #3 – Pretraining

This principle is used frequently by game developers in the form of tutorials or linear introduction levels where the game introduces or demonstrates a concept, for example that the “A” button will make your game character jump, then players have to immediately use this new information to advance to the next level. Much like feature #2, pretraining is an element baked into *the process* of gameplay itself.

Feature #4 – Modality

Through controlled experiments using educational video games, researchers have found information presented by voice rather than on screen text shows strong evidence for increased memory retention. This, coupled with the coaching principle, is a great reason to keep your class sizes small and interactive. Speaking from personal experience, one of the best aspects of teaching in a video-game enhanced classroom is the instructor’s ability to *see, translate, and share* design ideas as they happen, without asking students to break away from the activity itself.

Feature #5 – Personalization

One of the easiest ways to leverage video games is to pick a game that is easy to customize and speak in a conversational style. *Minecraft* is a great example of this because it allows players to not only build large structures block by block, but also modify the exterior environment to fit their needs.

At the same time, be aware that casually mentioning topics like online bullying and harassment are an extremely sensitive subject for those who have experienced it, especially in library workshop settings where participants are less familiar with each other. It’s possible to over-personalize, and given the norms established in most library settings around privacy and anonymity, you may want to call this out in advance.

But is it Worth It?

Teaching with *Minecraft* is probably not going to happen overnight for you. It takes more than an afternoon to really understand what motivates players in the game, and why it's so popular. Chris Markman recalls that he purchased *Minecraft* in 2012 but didn't really "get it" until one summer during a month he was not working. Motivated by a desire to build huge projects, he started playing it again and found there was an entire side to the game that he had completely missed!

You might be wondering if all that time and effort was really worth it though? One could ask that about whether you have read all of the *Harry Potter* books? Here's the catch in library programming when you're leveraging the popularity of commercial products—if you like it intrinsically, it will never feel like work, but at the end of the day, it is a time investment that will apply to your ability to do your work better. To put it in perspective, it would take roughly the same amount of time to watch all of the *Harry Potter* movies as it would to really get a grasp of *Minecraft*.

The continued popularity of *Minecraft* for over a decade is proof of its enduring relevancy, and research has demonstrated that it is an environment which lends itself to teaching skills to youth. Perhaps the key to success with *Minecraft* based learning is mutual appreciation for the game. With a dash of creativity and problem solving, you can customize it to fit your needs.

Minecraft Modes

Because it is an open-ended sandbox style game, it's important to remember that there are probably as many different play styles for *Minecraft* as there are players. This is something to keep in mind as you approach the game as a librarian. Some readers are into fiction, others only read biographies—we all have unique taste. Similarly, in planning a *Minecraft* event you should make it really clear in promotional material exactly what to expect.

The two easiest ways to pitch *Minecraft* as an educational activity is to either highlight the game mode (creative, survival, multiplayer, etc.) or the learning objective. Mr. Markman presented a cybersecurity workshop at Minefaire, a popular traveling *Minecraft* expo in the US. In his program, *Building Better Bases*, two learning objectives were set forth: learning how to build a base and learning how to make it better in the process.

This was an activity designed to introduce the cybersecurity threat modeling as a concept to tweens without calling it threat modeling, and for the most part, it worked! Surprisingly, the biggest issue Mr. Markman faced at this event was the overwhelming number of students, not the material. Through this experience, he discovered that the biggest limiting factor for *Minecraft* in education isn't getting grips on the game mechanics (though important) but having enough time for each student to thoroughly explain their design concept and bridge those ideas with the learning objectives at hand.

With that in mind, below are the top 4 learning modes educators use with *Minecraft*, illustrated by the game itself. Each will attract a different audience/player type, and in turn you should pick what makes the most sense to you as a *Minecraft* player as well.

Mode #1 - Social Emotional Learning (SEL)

This is where the game can really shine as a group activity. The best advice, curated from multiple sources, is to have students create game rules and a code of conduct at the start of each session. This fits into the Social Emotion Learning (SEL) framework (see <https://casel.org>). It doesn't have to be a one-time deal either, this is a repeatable activity.

Another thing you're likely to run into during multiplayer *Minecraft* play is that students will end up organically self-organizing around different projects on their own. This allows you, the instructor, to play the role of project manager and occasionally take a step back to allow team members to sort things out on their own, or maybe offer logistical advice gleaned from years of library circulation experience.

Mode #2 – Artistic Expression

Single player *Minecraft* using creative mode is basically a 3D version of Microsoft Paint, allowing students to draw the equivalent of pixel art in 2D or build structures in a variety of outdoor environments. For larger projects there is a wealth of world editor software tools that basically take your game save file and allows a person to draw objects (and even import 3D files found elsewhere online) into the game world with a few clicks. Working with world editor tools does have a learning curve, but there are lots of video tutorials online to walk you and your students through it.

There are also a number of export options that would allow students to export what they make in *Minecraft* to a 3D print. This involves installing some extra software and having a good sense of the limitations of your library's 3D printer, but it's a really popular idea seen at several makerspaces. Students are amazed to see their design ideas come to life this way.

Mode #3 – Code School

This is the mode you're probably most familiar with in terms of library programming, brought to you by code.org (see <https://code.org/minecraft> for a list of lesson plans), the publishing industry (there are at least a dozen books about how to make your *Minecraft* add-ons in Java) and various after school and summer programs. *Minecraft* and coding go hand in hand. The popularity of the game was propelled by its extendable framework and ability for enthusiasts to create their own modifications for the game.

These lessons may be a little dull and a bit gimmicky (the same material could be covered by any other fandom just as effectively) but as an early introduction to programming concepts it does work on some level. *Minecraft Education Edition* offers an enhanced interface or version of similar coding tutorials, but as of 2019 the licensing structure for that version of the game makes it really difficult to implement outside of a school library.

Maybe someday Microsoft will drop the requirement for host institutions to enroll in Office365 for Education to get classroom access to *Education Edition*, but in the meantime, there are plenty of alternatives for teaching coding basics with *Minecraft*.

Mode #4 – Meta*Minecraft*

This is a concept that seems to be gaining more traction in the *Minecraft* education community and is what this project was based around: how can a teacher leverage a student's understanding of the underlying *mechanics* of *Minecraft* in novel ways to demonstrate a point? The lesson plan in this toolkit highlights the survival aspect and strategy, but other educators may use *Minecraft* as a way to explore game play design *inside the game*.

Another way to approach this mode which is not explored in this toolkit is to take the configuration and setup of a *Minecraft* server as the basis for a project-based learning activity. Ultimately, there is too much content to cover in a single lesson but as a workshop series this could still work. The utility of a library run *Minecraft* server is debatable because Microsoft has made multiplayer much easier to connect with friends in a 1:1 fashion through the Xbox Live ecosystem, but you can begin to see how *Minecraft* can work in an education setting on multiple levels.

Is *Minecraft* Right for Your Library?

There are a lot of social stigmas surrounding video games and video game communities that you should consider before jumping headfirst into *Minecraft*. Some of them are debates that go back decades and have no end, others are silly distractions and memes, but perhaps the most important stigma to consider are discussions around cyberbullying and online harassment.

It's important to have a plan in place. Your library probably has a set of community guidelines that protect customers from this behavior in the library, but a lot of *Minecraft* activity is both virtual and distributed across mobile phones, video game consoles, and tons of other devices that are well outside the reach of your IT policy.

We would suggest choosing your multiplayer servers and online discussion forums carefully—there are enough malicious people online who do actively do things like plant viruses in *Minecraft* texture packs or try to steal *Minecraft* account info to either resell or harass other players. Thankfully you can avoid most if not all of these issues by sticking to locally hosted *Minecraft* worlds and disabling chat.

This is one of the major advantages of using *Minecraft Education Edition*, because it includes a “classroom mode” add-on that gives instructors easy access to a set of admin tools to keep players out of trouble. Here a secret to share with you: most of those tools are already built into the game, you just need to be comfortable using *Minecraft's* command tools (see <https://minecraft.gamepedia.com/Commands> for a list of examples).

Beyond tech considerations, also be aware that gatekeeping runs rampant in video game circles, and doubly so for teens. The quickest way for a teenager to lose interest in *Minecraft* is to have a younger brother or sister who enjoys playing the game. This is a trope that plays out in pop culture continuously, and marketing companies know this. At this moment in 2019 with the release of *Minecraft's* first AR mobile game on the horizon, *Minecraft Earth*, we seem to be headed into a renaissance of sorts, with older teens who played the game religiously when they were tweens in 2009 finding joy in *Minecraft* again as they enter their early 20's.

We encourage you to visit [youtube.com](https://www.youtube.com) and search the phrase “Minecraft nostalgia.” Read the comments. The top video we found had 2.7 million views and was published a little over a year ago. Below is a quote from a YouTuber named Tyler Vincent, which perfectly captures the impact that this game has had on him:

I was born in 2003 and got Minecraft in 2009 and although my memories of this blocky wonder has partly faded from my memory I still cry for this video because of the memories I will never forget, like the time I figured out that TNT will make a chain reaction, or when I found my first diamond or when I finally grinded enough ores to build the richest house out of all my friends. I might of forget the first tree I beat with my hands but I will never forget the time I went home early from my friends house just because my dad decided to pay the \$26 for the game that ended up that ended up being worth \$1million to me.

That is the power of video games on the psyche of young people today. We may not understand it 100% without direct experience, but you can see how gaming can have a lasting effect and a positive influence on the social and emotional growth of youth today. That is why it is so important to make a positive connection between your library and this game. *Minecraft* will fade in and out of popularity, but it will never go away.

Frequently Asked Questions

How much does it cost?

A single user license for the PC version is currently \$26, but in a lot of cases you can probably run a program for free. On the Pacific Library Partnership blog Chris Markman did a series of posts (www.plpinfo.org/minecraft) talking about the different versions of the game and comparing costs but eventually found A) local Microsoft Stores are a great source for hardware loans and B) most of the people who want to join these events are probably fans and have their own account.

Do I need a fast computer?

Nope! You can run a modified version of *Minecraft* on a \$10 Raspberry Pi computer. It won't be the full version but it's enough to tinker with. If you tried to play *Minecraft* when it first came out in 2009, it was a bit of a resource hog on low-end machines, but there's an optimized version for Windows 10 now and a few of optional 3rd party plugins (check out "Optifine" at optifine.net) that help with performance.

Will it work on a Chromebook or iPad?

Sort of. Chromebooks are tricky but newer models should be able to run the Android version. iPads are a definite yes, including *Education Edition*. Keep in mind any mobile phone released in the last couple years can probably run the mobile version of *Minecraft* as well. It's a super portable game.

Do I need to be an expert?

Not really, no. Would you call someone who has seen all of the *Harry Potter* movies an expert in wizardry? Probably not, right? There is much more to read but that's the level of commitment we're talking for baseline understanding, roughly 20 hours split up over a few weeks. Keep in mind there will be students joining you who have played *thousands* of hours over the years—you're not trying to beat them! Use them as an asset. As one YouTuber perfectly described it, "part of the fun of playing *Minecraft* is not knowing how to play *Minecraft*". This game has been actively developed for over 10 years, there is a ton of stuff in there. You should know enough about the game in terms of keywords to know how to effectively Google for answers. There is also an awesome community of educators coordinated by well credentialed Microsoft staff to learn from at <https://education.minecraft.net/community/connect-with-others/>, and the twitter hashtag [#MinecraftEDU](https://twitter.com/MinecraftEDU) is a good resource where people are always sharing advice and best practices.

Selected Bibliography

Anderson, Monica. "Parents, Teens and Digital Monitoring: How Parents Talk to Teens About Acceptable Online Behavior" *Pew Research Center* (2016).

<https://www.pewinternet.org/2016/01/07/how-parents-talk-to-teens-about-acceptable-online-behavior/>

Clark, Ruth C., and Richard E. Mayer. *E-Learning and the Science of Instruction: Proven Guidelines for Consumers and Designers of Multimedia Learning*. 4 edition. Hoboken, New Jersey: Wiley, 2016.

Farber, Matthew. "How Data Privacy Lessons in Alternative Reality Games Can Help Kids In Real Life | MindShift | KQED News," 2018. <https://www.kqed.org/mindshift/51772/how-data-privacy-lessons-in-alternative-reality-games-can-help-kids-in-real-life>.

Nebel, Steve, Sascha Schneider, and Günter Daniel Rey. "Mining Learning and Crafting Scientific Experiments: A Literature Review on the Use of Minecraft in Education and Research." *Educational Technology & Society* 19, no. 2 (2016): 355–66.

Willett, Rebekah. "Microsoft Bought Minecraft ... Who Knows What's Going to Happen?!: A Sociocultural Analysis of 8-9-Year-Olds' Understanding of Commercial Online Gaming Industries." *Learning, Media and Technology* 43, no. 1 (2018): 101–16.
<https://doi.org/10.1080/17439884.2016.1194296>.

"A Day in the Life of a High School Teen" *Office of Population Affairs*, U.S. Department of Health and Human Services (2018). <https://www.hhs.gov/ash/oah/facts-and-stats/day-in-the-life/index.html>

"Be Internet Awesome", Google (2018) <https://beinternetawesome.withgoogle.com/>

"Children and parents: media use and attitudes report" Ofcom (2016).
https://www.ofcom.org.uk/data/assets/pdf_file/0034/93976/Children-Parents-Media-Use-Attitudes-Report-2016.pdf

"Children's media lives: Year 4 Findings" Ofcom (2017).
https://www.ofcom.org.uk/data/assets/pdf_file/0022/108283/children-media-lives-2017.pdf

“Media Use by Teens and Tweens” Common Sense Media (2015).

https://www.commonsensemedia.org/sites/default/files/uploads/research/census_researchreport.pdf

“Stop. Think. Connect.”, U.S. Department of Homeland Security (2018).

<https://www.dhs.gov/stophinkconnect#>

Additional Online Resources

A Short Guide for Library Computer Labs Wanting to Use Minecraft: Part 1:

<http://plpinfo.org/installing-minecraft/>

A Short Guide for Library Computer Labs Wanting to Use Minecraft: Part 2:

<http://plpinfo.org/a-short-guide-for-library-computer-labs-wanting-to-use-minecraft-part-2/>

A Short Guide for Library Computer Labs Wanting to Use Minecraft: Part 3:

<http://plpinfo.org/a-short-guide-for-library-computer-labs-wanting-to-use-minecraft-part-3/>

Minecraft Education Edition: <https://education.minecraft.net/how-it-works/why-minecraft/>

Minecraft Hour of Code Tutorials: <https://code.org/minecraft>



Lesson Preparation

Preparing for your *Minecraft* Workshop

Part A / Wood Axe (1 Hour)

If you're already familiar with Minecraft, either as a gamer yourself or having seen other people play, skip this step and move to Part B.

This learning track is more like a prerequisite—it's really important that you have lived in *Minecraft*'s survival mode for more than a day, which is about 20 minutes in real world time. Your goal is to understand the “first night” problem.

The demo version of *Minecraft* is free and has a 2-hour limit, which is enough to time get a sense of what students in the workshop will be doing and how it connects to threat modeling.

Linked below is a video tutorial from a YouTuber that shows the typical “workflow” in a new game and offers some useful tips for new players. Keep in mind the game itself also contains an optional tutorial the first time it is launched.

The Minecraft Survival Guide - Surviving Your First Night!:

<https://youtu.be/bUudx1cPiAA>

Tutorial/Your First 10 Minutes:

https://Minecraft.gamepedia.com/Tutorials/Your_first_10_minutes



Part B / Iron Sword (30 Minutes)

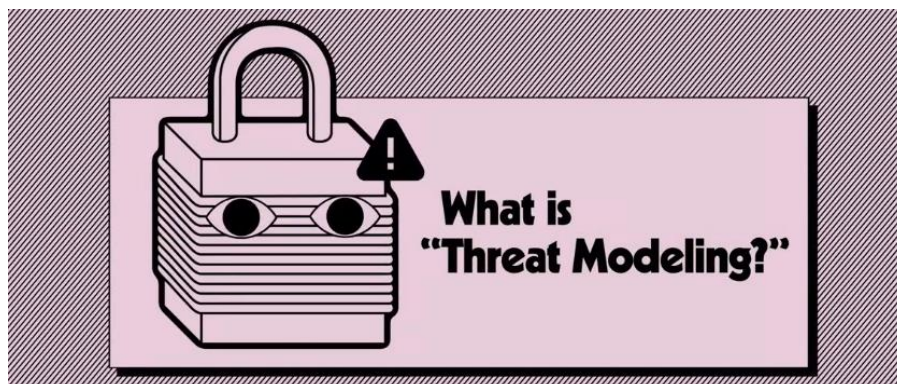
Read the “Your Security Plan” (<https://ssd.eff.org/en/module/your-security-plan>) section of the Electronic Frontier Foundation’s *Surveillance Self Defense Guide*. EFF’s team does a great job explaining threat modeling in a jargon-free tone. This short video is the 90 second elevator pitch version of the same idea:

What is threat modeling: https://video.vice.com/en_us/video/motherboard-hacking-week-what-is-threat-modeling/5a0b2378177dd428d3222d68

The student workshop follows this same process of collecting, evaluating, and ranking risks to devise a personalized security plan, but does so in the familiar arena of *Minecraft*’s survival mode. See if you can answer these five threat modeling steps based on your experience in Part A.

1. **What do I want to protect?**
2. **Who do I want to protect it from?**
3. **How bad are the consequences if I fail?**
4. **How likely is it that I will need to protect it?**
5. **How much trouble am I willing to go through to try to prevent potential consequences?**

Finally, review the ***Building Better Bases Lesson Plan*** and related handouts in this toolkit. This is the workshop lesson plan framework. Both are also available online at www.plpinfo.org/Minecraft.



Part C / Diamond Pickaxe (30-60 Minutes)

Having completed parts A and B, now it's time to try it out yourself! Spend 10-15 minutes filling out the handout sample or draw your own threat model for *Minecraft*. As a stretch goal, try threat modeling a *Minecraft* server itself. What are some of the issues you might run into? How could they be avoided?

As you do this, consider two simple security facts below:

Security Fact #1 – *Because everyone has a different threat model, it's difficult to prescribe one-size-fits-all security solutions.*

Security Fact #2 – *Security happens in layers, and how you layer is just as important as the number of layers.*

To illustrate these points further, think of a house. The front door has a lock, but for extra ease of mind you might hide valuables in a safe with a separate lock and key. If the safe is placed outside of the house, the first layer of security (the front door) is less effective. That's fact #2 in action. If a person is not worried about anyone ever breaking into their house because they're 100% insured, discussing what makes a good safe versus a bad safe really misses the mark for this person because their threat model is completely different (fact #1).

In the world of *Minecraft*, one might think building extra walls are always better. More walls = more security? Not necessarily—it's a trade-off. There are compromises along the way. Threat modeling is a way to explore these design decisions *before* spending a lot of time implementing security ideas that don't work or are easy to bypass.

Your goal as the instructor is to facilitate a discussion around these two simple facts about security, and to get students to practice threat modeling for the first time.

Are you interested in *Minecraft* Education Edition? Continue to Part D. Otherwise, there are some "extra credit" videos linked in Part E that talk about threat modeling from a more in-depth, technical perspective, but you're otherwise done. These are not required viewings by any stretch, but are food for thought if you'd like to learn more about security practices.

Tutorials/Setting up a Server:

https://Minecraft.gamepedia.com/Tutorials/Setting_up_a_server

Part D / Enchantment Table (2 hours)

Let's get you signed up! The *Minecraft* Mentor program has a few extra steps or badges to complete before you'll have access to the software. Full details are in the link below.

Minecraft Education Edition, Mentor Program: <https://aka.ms/joinmee>

Part E / Extra Credit (2 hours)

These video links show some diversity of opinion. These are far more technical than you need to be in a cybersecurity concepts workshop and come direct from experts talking to experts in security conferences, but browsing these might provide some interesting ideas or talking points for your students.

Threat Modeling in 2019: <https://youtu.be/ZoxHlpzaZ6U>

APPSEC Cali 2018 - Threat Modeling Toolkit: https://youtu.be/KGy_KCRUGd4

Threat Modeling Made Interactive: <https://youtu.be/ZtSrcq7gscE>



Lesson Plan

Building Better Bases Cybersecurity Lesson

Part I – Building Better Bases Outline

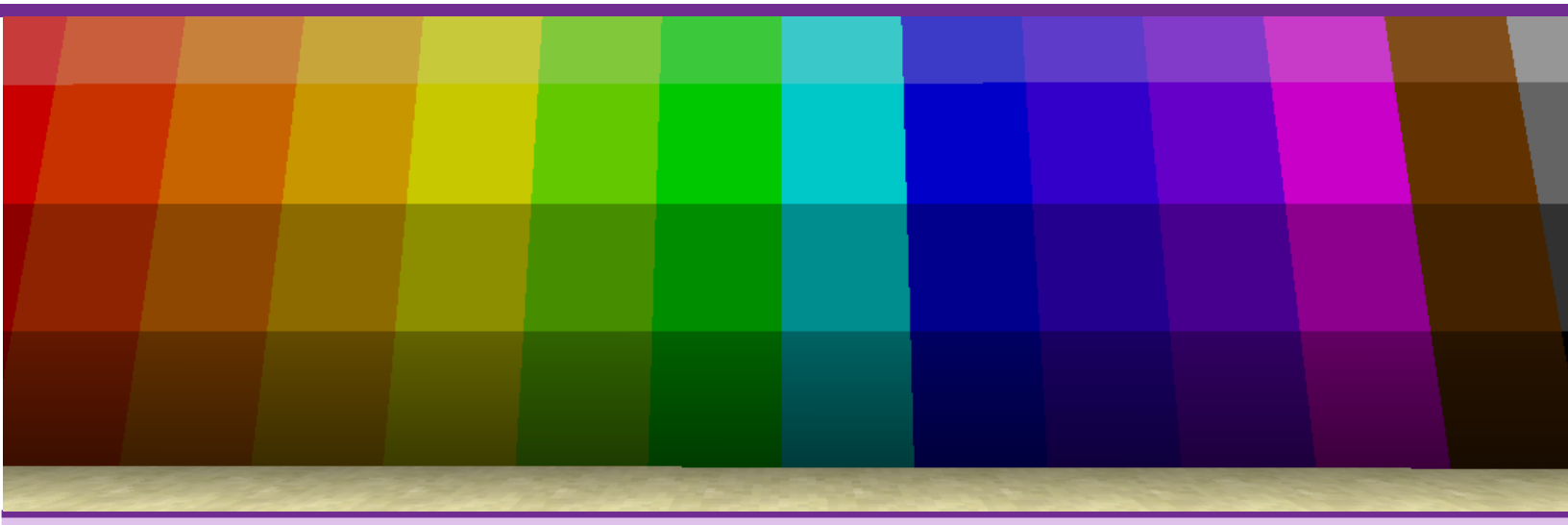
This contains a sample lesson plan including student activities, guiding questions and learning objectives. Based on your computer lab or classroom setup the actual workshop schedule should be modified to allow maximum discussion time, e.g. if you have more students than computers, ask them to work in small groups and complete their threat model together.

Part II – Building Better Bases Slides and Handout

This PowerPoint deck sample is also available for you to use or modify. Slides 1-5 introduce the importance of *security layers* as a design methodology and demonstrate why we utilize threat modeling—the process allows you to plan for security incidents in advance rather than after it is too late.

Slides 6-10 reference the two page *Building Better Bases* handout, with a different Minecraft mob or monster present in the top row of the chart and their attributes or metadata listed below. It's important to emphasize here that this is just *one mode* of threat modeling. We ask them to do this on paper *before* jumping into Minecraft to illustrate the parallels between real-world cybersecurity threat modeling and Minecraft gameplay. For example, the same way an investigative journalist is likely to protect their passwords and online identity differently than a retired schoolteacher, a person who plays Minecraft multiplayer versus other human players will design a base differently than someone who only plays against the computer. The key element to emphasize is that in both Minecraft and real-world cybersecurity, there is no universal best solution that covers all people or circumstances, only best practices or security tools used in combination.

This page intentionally left blank with no page number



Building Better Bases: Outline

Building Better Bases Outline

Title: Building Better Bases: Threat Modeling for Cyber Survival

Short Description: Practice threat modeling, an important cybersecurity concept, through group discussion and guided base building.

Introduction: The internet can be a scary place, full of identity theft, data breaches, and bad apples. In this workshop students will get an introduction to threat modeling, a common information security practice, and begin to understand how security measures are shaped not only by the types of risks at hand, but also the probability they will happen and the impact if or when they did occur.

Student Ages: 8+

Subject: Computer Science

Skills: Cybersecurity, Design

Lesson Language: English

Learning Objectives:

1. Practice threat modeling, a fundamental cybersecurity skill.
2. Collect and analyze design requirements based on Minecraft knowledge.
3. Evaluate security features based on their practicality and effectiveness.

Guiding Ideas and Questions:

- *What do you want to protect in Minecraft? What info about yourself do you want to protect online?*

The idea behind this question is to get students thinking about how their security needs are individualized. Not everyone has the same threat model.

- *Who do you want to protect your Minecraft base from? For example, are you playing single player (against the computer) or on multiplayer server with other people?*

Context is key. In the same way an environment change in Minecraft could mean fending off more monsters, in the real world as laws change or website become hacked, so do your risk factors.

- *How likely is it that you will need to protect your Minecraft base?*

In other words, what's the probability of a security incident actually happening. Low probability threats are usually safe to ignore. If you go to bed at night in Minecraft there's very low probability of an attack.

- *How bad are the consequences if you fail? What's the worst-case scenario?*

Planning ahead is your best defense in Minecraft and in real life.

- *What are the tradeoffs between convenience and security?*

Many students begin the process of base design by creating doorways or path ways over lava that are extremely difficult to enter or exit, but also put themselves at risk if they are not careful. Is this really the best solution?

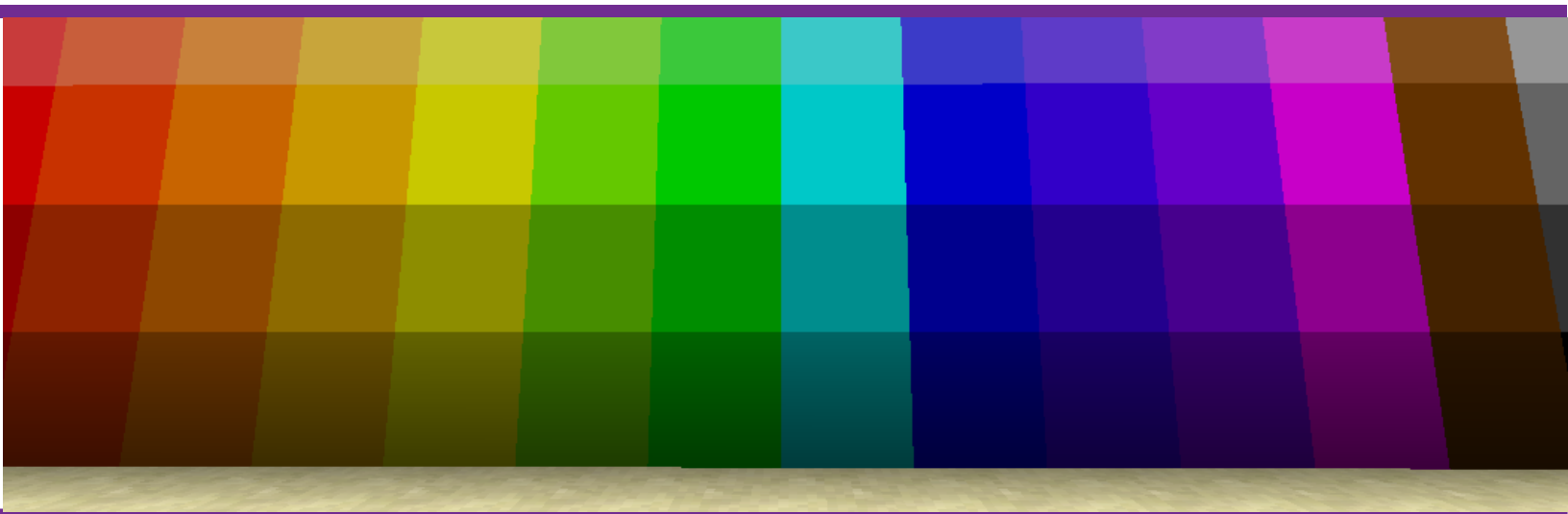
Student Activities:

1. Have students complete the (partially filled) out threat model on the associated worksheet individually or as a group. The top level describes what is at **risk**, and below that is each individual threat and the harm they could cause.
2. While looking at the completed threat model chart, rate each risk based on the **probability** and **impact** of each threat. Is it high, medium, or low? For example, are Creepers (high probability, high impact) a bigger threat than Skeletons (medium probability, low impact)? Should you care at all about dragons (low probability, high impact)?
3. Using the answers from the previous step and previously collected Minecraft knowledge, work towards designing the best security defenses possible in game. Try to fix or defend the *high probability, high impact* problems first. Use the Security Layer Map and/or 16x16 grid lines on the worksheet to help plan before they build.
4. As time allows, ask students to present their design ideas. Relate them back to the threat model as it was completed. Students may be eager to explain their concept in full detail. Pay close attention to the interaction between security layers and context.

Performance Expectations:

- Students should be able to explain and justify their design choices based on a complete threat model.
- Threat models do not need to be complete but should instead reflect their understanding of the game.

This page intentionally left blank with no page number



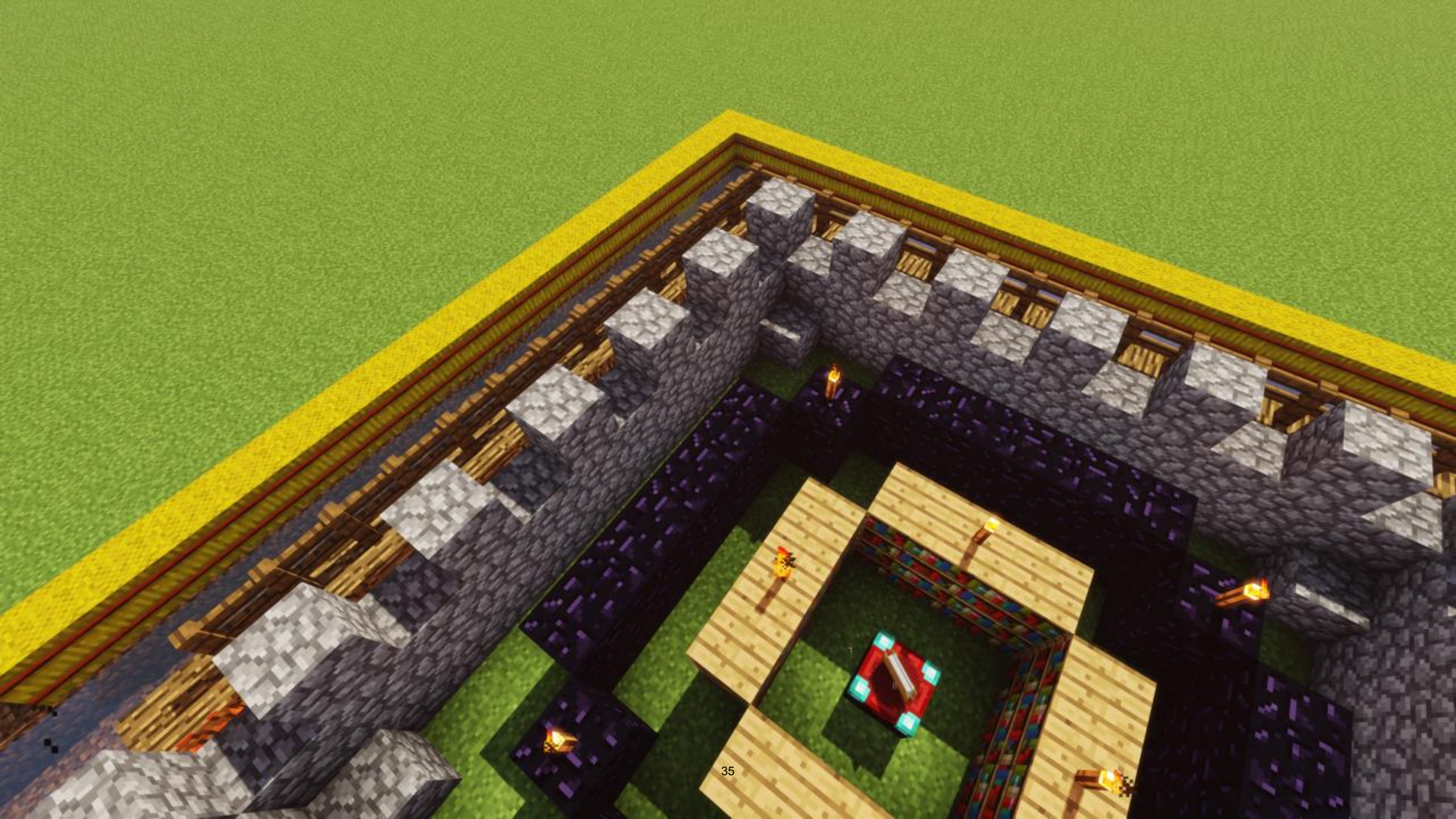
Building Better Bases: Slides and Handout

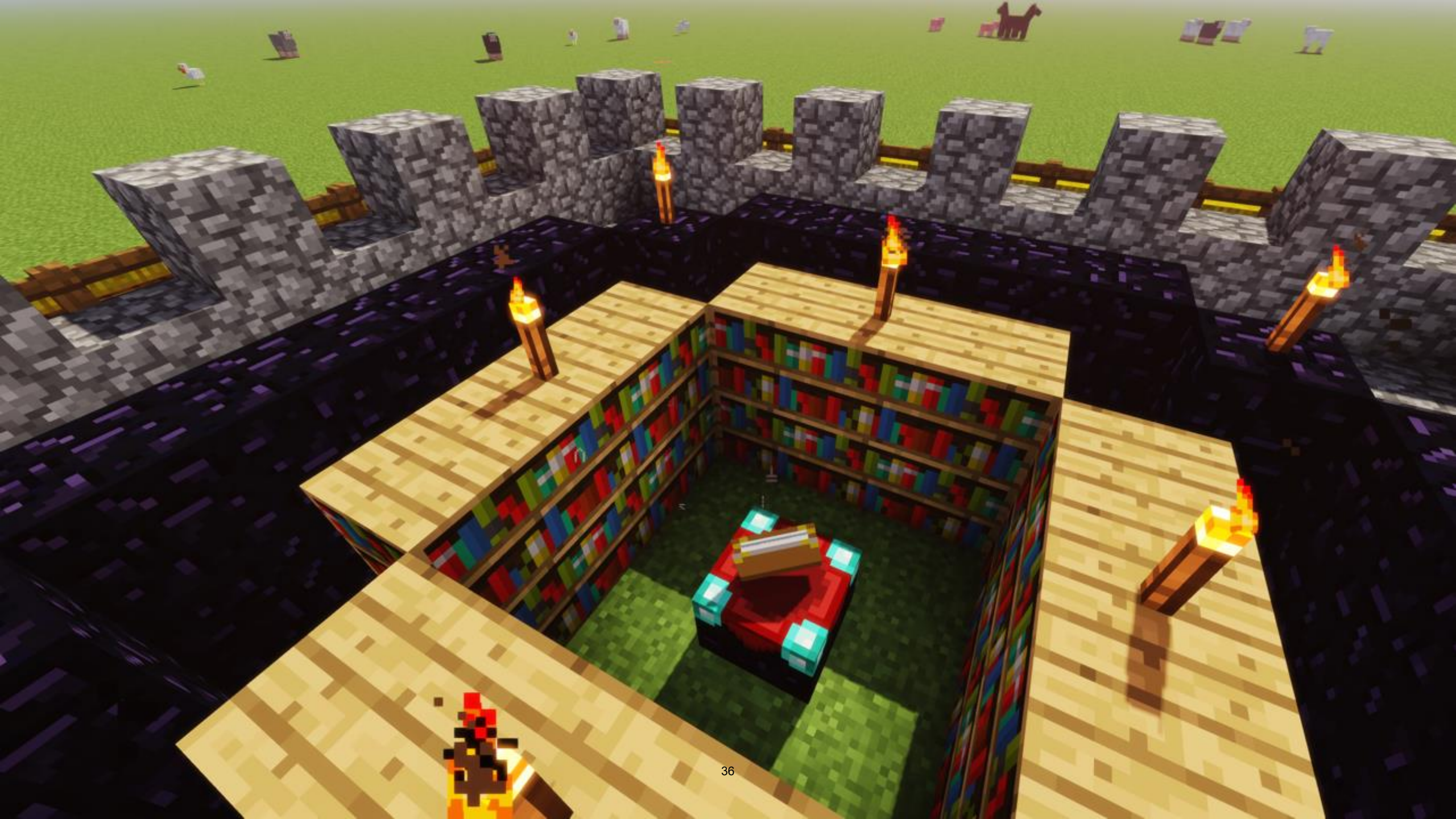


Building Better Bases

Threat Modeling for
Cyber Survival

Chris Markman
Palo Alto City Library

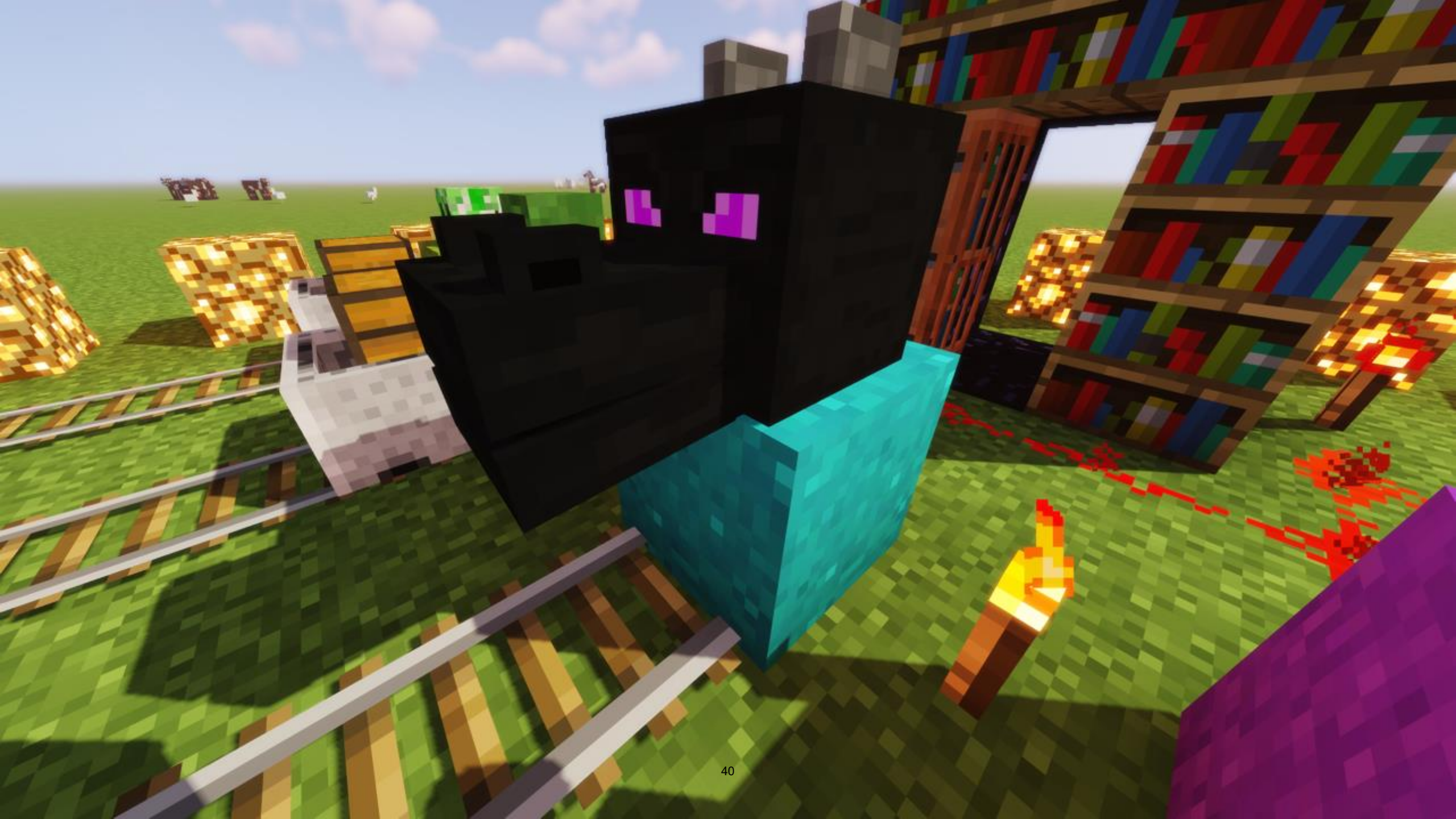








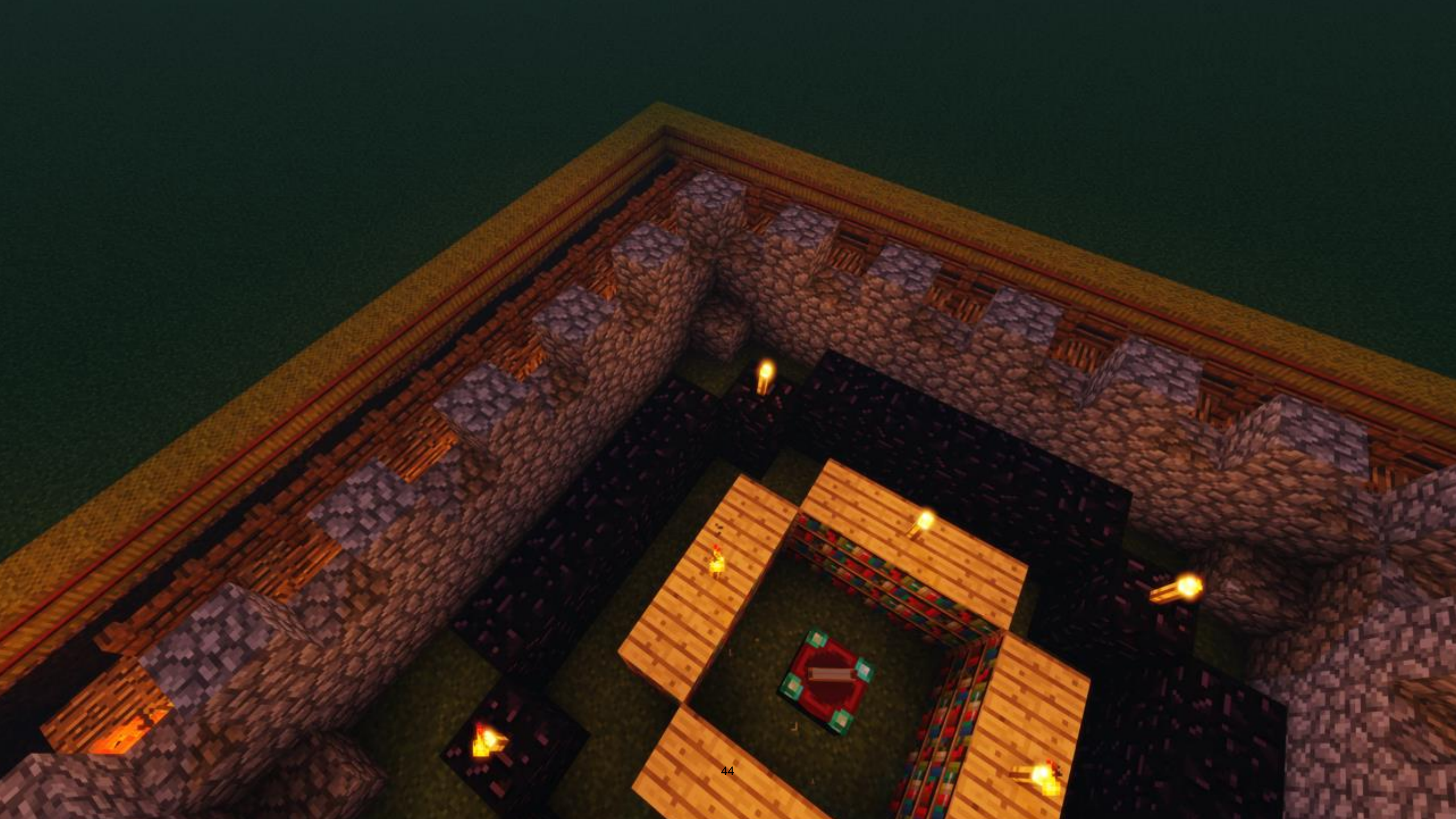










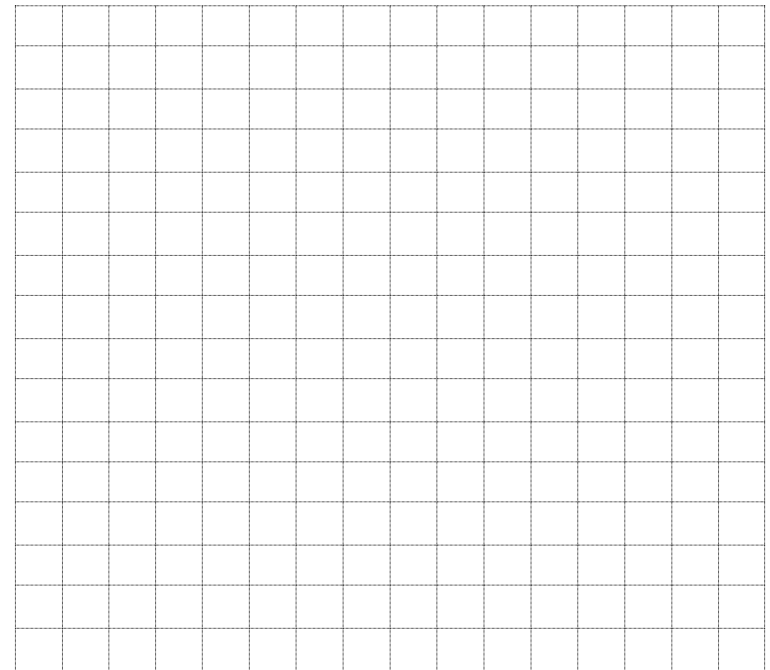
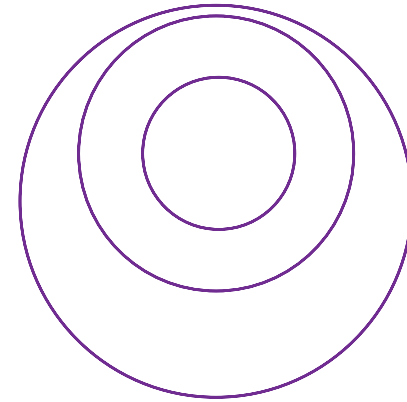


Building Better Bases: Handout

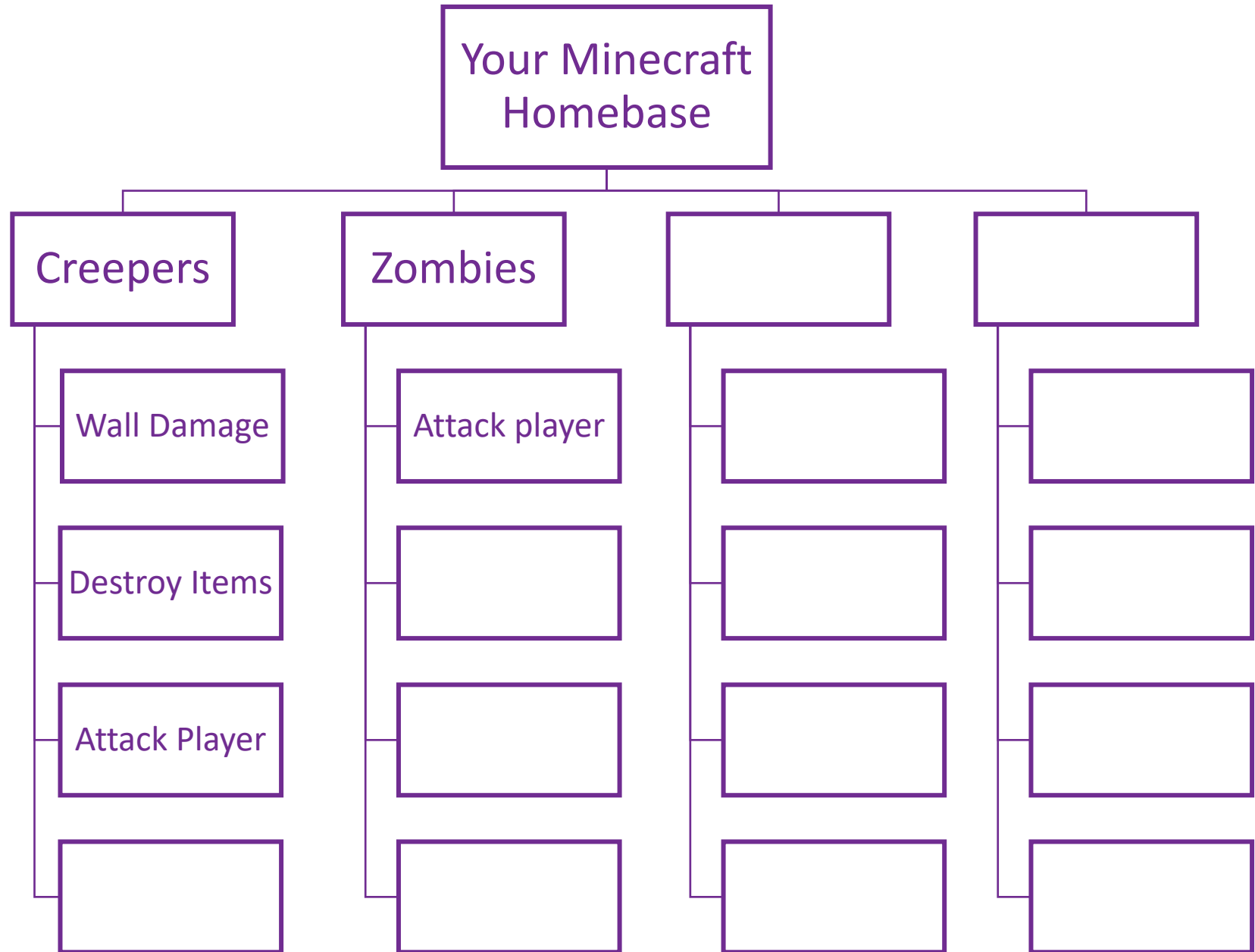
Workshop Steps

1. Complete the threat model on the reverse side of this page. The top level describes what is at risk (your base), and below that is each individual threat and the harm they could cause to your base.
2. Look at the completed chart. Think about what is the **probability** and **impact** of each threat? Is it high, medium, or low? For example, are *Creepers a bigger threat than Skeletons*? Should you care about dragons?
3. Use your answers in the threat model to help design the **safest, most secure** base possible in Minecraft. Try to fix or defend the *high probability, high impact* problems first. Use the Security Layer Map and/or 16x16 grid lines on this page to help you plan.

Security Layer Map



MINEFAIRE 2019 - San Mateo County Event Center - Building Better Bases: Threat Modeling for Cyber Survival
For more info and contact info please visit www.plpinfo.org/Minecraft



(See reverse side for instructions)



Student Plan

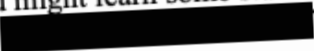
The Digital Fortress: Self-Guided Lesson

The Digital Fortress is a self-guided version of the *Building Better Bases* lesson. It is intended to allow libraries to offer the cybersecurity lesson as a passive program. It encompasses portions of the lesson outline and handout in a standalone, offline-first format. The format imitates a short story utilizing a glitch aesthetic and comic book “cyberpunk” feel, including intentionally redacted or obscured story points, a binary code puzzle, and youth pop culture references. The lesson unfolds through a simulated chat session between two Minecraft players. In the second half of the booklet, rather than filling out a single, all-encompassing chart, threat models are expressed as individual monster profiles.

The Digital Fortress

[illegible]

01010100 01101000 01100101 00100000 01000100 01101001
01100111 01101001 01110100 01100001 01101100 00100000
01000110 01101111 01110010 01110100 01110010 01100101
01110011 01110011 00101110 00100000 01000111 01101111
01101111 01100100 00100000 01101010 01101111 01100010
00101110

- 31213\$> Hi. My name is 31213. Not the zip code.
Palindrome. I made this book because no one
else has. You might learn some stuff about
hacking and 
- 31213\$> ...self-defense I mean...
- 31213\$> I got the idea from someone else. They know
Minecraft better than I do, but that's ok. That's
1/2 the fun.
- 31213\$> Anyway, here is the plan:
- 31213\$> First we time travel in our mind. Then we are
going to steal their ideas, like i n c e p t i o n
- 31213\$> Then we build.
- 31213\$> By the Way; there might be clues...

31213\$> Have you noticed the internet is a little...

31213\$> CrAzY?

31213\$> Do you know how easy it is for someone to ruin you day? I do.

31213\$> That's what this is about.

████ \$>

████ ██████████

31213\$> No because I don't think Minecraft is about the game you see on the screen.

31213\$> I kn0w Minecraft is in your head.

31213\$> That's the problem (for now anyway)

31213\$>

████████████████████

████ \$>

██

31213\$> lol

31213\$> Did you get that from ready player one?

31213\$> So check this out:
https://www.exploring-castles.com/castle_designs/

31213\$> "Mott and Bailey"

[illegible]

312313\$> Why is that?

§

[REDACTED] [REDACTED]

312313\$> Correct-o friend-o
312313\$> Until everyone started using bow and arrow

312313\$> did you find any others?

312313\$> ???

312313\$> I wanted to show you this for a reason

312313\$> think about what a castle did

312313\$> wh0 was it for?

312313\$> Your stuff online is the same way

████ \$> ██████████ ██████████

312313\$> Yeah that does look smilier

312313\$> Yeah that does look similar

312313\$> oops lol

312313\$> but the M&B design didn't last forever, they had to...

312313\$> innovate

312313\$> :fire: arrows ruined everything, then it was time
for stone walls...see the similarity?

312313\$> that's the thing, even the smartest dude is still
dumb 1000 years later

312313\$> with castles anyway LOL

312313\$> we can do better, but we need to think this through

312313\$> fire burns wood right? no lava near my bed

312313\$> not making that mistake again haha

██████████ \$> ██████████ mistake ██████████

312313\$> yup that's the idea

312313\$> think three steps ahead

312313\$> maybe 4 if you're lucky

[REDACTED] \$>

[REDACTED] pvp [REDACTED]

312313\$> good point, the bots are easier tho

312313\$> maybe we can learn their AI?

312313\$> think three steps ahead. Plan 4 the worst

312313\$> use this

[31213 has uploaded not_a_virus.exe]

312313\$> sorry that was a joke, not a test, just rename it
.txt instead of .exe *you'll be amazed*

312313\$> there's some homework involved, hope you
don't mind. 4 steps isn't too bad, right?

312313\$>

<not_a_virus.txt>

file_created:

7/1/2018

last_modified:

8/8/2019

impact noun | 'im,pakt |

• the action of one object coming forcibly into contact with another: *there was the sound of a third impact | bullets that expand and cause devastating injury on impact.*

• the effect or influence of one person, thing, or action, on another: *creepers have a huge impact on cobblestone walls* ^ _ ^

probability | ,prəbə'bilədē | noun
(plural **probabilities**)

• the extent to which something is probable; the likelihood of something happening or being the case: *the rain will make the probability of their arrival even greater.*

• a probable or the most probable event: *the [redacted] - [redacted] revolution was a strong probability | there was a high probability their parents would never play Minecraft.*

• *Mathematics* the extent to which an event is likely to occur, measured by the ratio of the favorable cases to the whole number of cases possible: *the area under the curve represents probability | a probability of 0.5.*

Step 1. Name the mob

Step 2. Fill out the probability

Step 3. Fill out the impact

Step 4. Profit? (deal with high impact / high probability first)

name_of_mob:

ENDERMAN

impact_of_attack

low / medium / high

probability_of_attack

low / medium / high

field_notes.txt

— pumpkins



← put it on
your head

— why do they pick
up blocks?

312313\$> so that's how I would do it

312313\$> but pretty much do whatever makes sense to you

312313\$> they are always adding new mobs so this is gonna change, ur rating might change too

312313\$> when you think you have enough info start building based on the "high impact" stuff

312313\$> this probably seems obvious but most people never really plan, they just get fire arrows burning down their stuff and have to start over

312313\$>



[31213 has uploaded threat_model_template.txt]

 \$>



312313\$> might seem silly but if you can do this in Minecraft you can do it in real life. Ze Real Security Pros call this "threat modeling"

312313\$> BTW got some books for ya at the end too ^ _ ^

--

--

--

<want_to_know_more?.txt>

Cryptonomicon (1999)
Stephenson, Neal

- This is a really long read but he did the research. Maybe it'll be a movie some day?

The History of Castles: Fortifications
Around the World (2001)
Gravett, Christopher

- There's lots of stuff on the web (and pictures!) but this is cool too.

Little Brother (2008)
Doctorow, Cory

- I'm guessing you read this already? Another sci-fi in the list but way shorter. There's a sequel too.

Minecrafter:
The Unofficial Guide to Minecraft & Other
Building Games (2013)

- Some cool ideas in this, but how secure are they?

Epilogue:

Not a book but def check this out when you get a chance.

>>> <https://ssd.eff.org/en/module/your-security-plan> <<<