LESSON PLAN

How to Train Your Algorithm

This lesson is part of *USE, UNDERSTAND & ENGAGE: A Digital Media Literacy Framework for Canadian Schools*: http://mediasmarts.ca/teacher-resources/digital-literacy-framework.

LEVEL: Grade 9 to 12

ABOUT THE AUTHOR: Matthew Johnson, Director of Education, MediaSmarts

Overview

In this lesson, students will learn about algorithms and how they function, particularly recommendation algorithms utilized by popular apps like YouTube, TikTok, Instagram, and Netflix. Students explore the role of optimization goals such as watch time, engagement, and daily active use in shaping the content algorithms prioritize. Through activities like "red teaming," students will critically analyze the potential downsides and biases of these optimization goals. Students will also discover how to train algorithms by providing both explicit inputs through actions like liking and sharing, and understand the implications of implicit inputs gathered from their online activity. Finally, students design their own algorithm for an app of their choice, identifying which goals it should be optimized for and how they should be weighted as well as what inputs it should use.

Learning Outcomes

Big ideas/key concepts: Students will understand that...

Media are constructions:

- Algorithms are designed and optimized for a particular purpose

Media have social and political implications:

- Recommendation algorithms can have negative impacts on people and society due to their optimization goals

Media have commercial implications:

- Algorithms' design and optimization serve commercial purposes such as maximizing watch time and engagement

Digital media have unexpected audiences:

- Many apps, websites and other digital tools collect information while you are using them to use as inputs for their algorithms

Digital media experiences are shaped by the tools we use:

- How algorithms are designed and optimized influence how we use an app or tool

- It is possible to consciously "train" algorithms to influence the content they deliver

Key questions:

- How do algorithms work?
- What are some of the implications of how they work?
- How can we use them more consciously and mindfully?

Essential knowledge: Students will know...

Reading media: Operation of recommendation algorithms, including optimization goals and explicit and implicit inputs

Consumer awareness: Commercial goals of algorithms' optimization goals

Privacy and security: Collection of personal data for use as implicit inputs

Performance tasks: Students will be able to...

Access: Find and use privacy settings

Use: Refresh and customize an app's recommendation algorithm

Understand: Analyze the implications and potential impacts of algorithms, their optimization goals and their inputs

Engage: Identify potential harms of recommendation algorithms, take steps to use algorithms more mindfully, and design an algorithm that would mitigate those harms

Student-friendly outcomes:

We will learn how algorithms and recommendation systems work, what their optimization goals are, and key terms like "algorithm," "optimization goal," and "implicit input."

We will think about the social, political, and commercial impacts of algorithms, how they collect and use our data, and how we can use them more mindfully.

We will find and use privacy settings, customize app recommendations, analyze the effects of algorithms, and design ways to reduce potential harms caused by recommendation systems.

Preparation

Make sure that you are able to show the embedded videos

Procedure

Start by asking students:

- What was the last video you watched?
- Did you choose it, or did you watch it because it was recommended by an algorithm?

Ask students what they think a recommendation algorithm is. First make sure they understand the term algorithm, and that algorithms sort data in order to find patterns and make predictions and recommendations.

Explain to students that a lot of what we see online, including videos, comes from recommendation algorithms like YouTube's Up Next bar, TikTok's For You page and Instagram's Story tab:

- Seven out of ten views on YouTube come from the Up Next bar
- More than nine in ten views on TikTok come from the For You page.

OPTIMIZING ALGORITHMS

Explain to students that algorithms are not programmed like regular computer programs. Instead, they are trained on data and then **optimized** for a particular goal. That means that they constantly test themselves to see how well they're doing at meeting that goal, and then make changes to do it better.

For instance, the Netflix algorithm is optimized to help you find something that you want to watch in less than 90 seconds. It does this sorting and choosing thumbnails, as the last activity showed.

Tell students to think of another app they are familiar with that uses algorithmic recommendations. (Examples: TikTok, Instagram, YouTube, Spotify.)

Distribute the handout *Optimizing Algorithms* and go through the different optimization goals. (Point out that these are not the **only** possible goals, but they are common ones.)

Next, have them rank the optimization goals according to which they feel are the most important to the app or website. (You can have them do this individually, in pairs, or in small groups.)

If students have difficulty ranking the goals, tell them to think about what the algorithm rewards. For example:

- If it shows you more long videos and fewer short videos, it's trying to boost watch time.
- If it shows you things that get you upset, it's trying to boost engagement.
- If you worry about missing things if you're away too long, it's trying to boost daily active use.

Have students share their ranking with the class:

- How did they decide on their ranking?
- Did students (or groups) who evaluated the same app rank the goals similarly?
- If so, what makes it so clear what the app is optimized for?
- If not, why do they disagree?

THE COLD START PROBLEM

Explain to students that optimization goals are just half of how algorithms make decisions about what to show you.

The other half is your inputs: what the algorithm knows about you. For example, if the algorithm is optimized for watch time, it need to know what will make you watch longer.

There are two kinds of inputs: explicit and implicit. Explicit inputs are ones you know you are giving to the algorithm, while implicit inputs are ones you don't know you're sending. These come from the app or website watching what you do or getting information about you from someone else. For example, YouTube can use your Google search history, because they are owned by the same company. Other apps or websites may buy information from data brokers.

Distribute the handout *The Cold Start Problem*. Go through the inputs and point out that these are by no means all the inputs that algorithms use, just some examples.

Once students have sorted the inputs into explicit and implicit ones, ask:

- Can you think of any other **explicit** inputs? (Remind them that an explicit input is information they know they are sending.)
- Can you think of any **implicit** inputs? (If someone could see everything you do on your phone or computer, what would they know about you?)
- Are there any implicit inputs they feel uncomfortable with apps, websites or advertisers knowing about?
- Why might algorithms rely more heavily on implicit inputs over explicit ones?

After students have discussed for a few minutes, explain that algorithms rely on implicit inputs to overcome the Cold Start Problem. This just means that when you start using something that has algorithmic recommendations, the algorithm doesn't know much about you, so its recommendations aren't very accurate.

The more implicit inputs they use, the more quickly the algorithm becomes more accurate: if it's ever seemed to you that an app could "read your mind," or knew you better that you know yourself, that probably means it was using a lot of implicit inputs.

As the streaming music service Spotify says to advertisers, "The more they stream, the more we learn."

RED-TEAMING RECOMMENDATIONS

Now tell students that they are going to think about how the optimization goals you and the explicit and implicit inputs just discussed could go wrong in a similar way. They will do this through an exercise called red teaming. A "red team" is a group inside a business, a government or another organization whose job is to guess what might go wrong with a plan.

Distribute the handout *Red-teaming Recommendations*.

Divide the class into pairs or small groups. Have each pair or group choose one of the topics discussed in the previous exercises:

- Watch time: Trying to make users watch as much of each video as possible.

- Engagement: Getting users to Like, comment on and reply to as many videos as possible.
- Stickiness: Trying to make sure that users keep watching videos instead of leaving the platform.
- Virality: Encouraging users to share the videos they watch with as many people as possible.
- Daily active use: Encouraging users to share the videos they watch with as many people as possible.
- Implicit inputs: Collecting information the user doesn't know they're sending it, and using it to decide what to recommend.

(More than one pair or group can work on each goal).

Next, have students work in pairs or groups to identify every possible problem, risk or drawback of talking to chatbots as if they were real people. This should be done brainstorming-style, writing down as many thoughts as quickly as possible rather than expanding on each one.

After five minutes, ask them to consider an additional challenge prompt:

Once people who make videos learn what the app is optimized for, they will change the videos they make to try to "game" the algorithm. What effects might that have?

Give students another three to five minutes to think about the implications of the challenge prompt and write down any more problems they can think of.

Have all the pairs or groups share the results to make a master "red team" list for each optimization goal.

HOW TO TRAIN YOUR ALGORITHM

Go through the master "red team" lists with the class, so that everyone knows all the issues that were identified with each optimization goal.

Ask if they can think of any examples where an app or website's optimization goals backfired or led to bad outcomes. You can prompt them with these examples:

- YouTube optimizing for watch time led to videos getting longer and longer

- Snapchat optimizing for daily use made people spend an hour every day sending blank pictures just to keep up their Streaks
- Different sites optimizing for virality made "fake news" stories spread more widely than true ones
- Other sites optimizing for engagement made extreme, offensive and harassing posts get recommended over more civil ones.

Then ask:

- Think back to the video app you analyzed. Now that you know some of the concerns with the different things an app can be optimized for, do you agree with its optimization goals were ranked?
- Why or why not?

Next, have students brainstorm other optimization goals that algorithms could be aiming for. You can prompt students with these examples:

- Accuracy
- Civility (promoting positive interactions between users)
- Diversity (not showing you too much of the same thing)

After students have discussed these questions for a few minutes, explain to students that while we can't always affect what algorithms are optimized for, we can often train our algorithms to show us more of what we want, and less of what we don't want.

Distribute the handout *How to Train Your Algorithm* and show the video. Have students answer the questions in the video.

Next, tell students that you're now going to try consciously training an app's algorithm.

> You can have students do this activity individually or in small groups, or you can do it together as a class.

If students are doing it individually or in small groups, distribute the handout *Algorithm Training* and read through the instructions. Students can refresh and train their TikTok, Instagram, or YouTube accounts if they have one of those. If they do not have an account on any of those apps, or do not want to have the app forget what it already knows about them, you can log them into this YouTube account:

Email address: Tamealgorithm@gmail.com

Password: Gmsh2tyae!

If you are doing it together as a class, use the YouTube account above and go through the following instructions on a digital projector or digital whiteboard:

- Go to Myactivity.google.com
- Click or tap YouTube History
- Click or tap TURN OFF

REINVENTING RECOMMENDATIONS

Tell students that now that they know how to train the algorithms that their apps already use, it's time to think about how those algorithms should work.

Distribute the handout *Reinventing Recommendations* and go through the assignment with the class:

Have students use the interactive tool to choose either a type of app (for example, a video app, a social network, or a search engine) or an app that already exists (YouTube, Instagram, Google, etc.) and design how they think its algorithm should work.

Their assignment should include:

At least three **optimization goals** they think the algorithm should have. Make sure students understand that they are not limited to the optimization goals discussed in class, and remind them of some of the alternate optimization goals they brainstormed. They should **rank** these optimization goals by weight (how important they are to the algorithm's ranking) and explain why they chose each one and why they gave it that rank.

At least three **inputs** they think the algorithm should pay attention to. These also are not limited to the ones discussed in class; students can use any way that users could send information to platforms. For each one, they should identify whether it is an explicit or an implicit input and explain why they think the algorithm should pay attention to it.

STUDENT HANDOUT

HOW TO TRAIN YOUR ALGORITHM

Optimizing Algorithms

Think of an app that includes **videos** and that recommends and sorts things for you.

Read through the different optimization goals below:

- Stickiness: Trying to make sure that users keep watching videos instead of leaving the platform.
- Watch time: Trying to make users watch for as long as possible.
- Engagement: Getting users to Like, comment on and reply to as many videos as possible.
- Daily active use: Encouraging users to share the videos they watch with as many people as possible.
- Virality: Encouraging users to share the videos they watch with as many people as possible.

Next, rank them according to which you think is **most** optimized for. Be ready to explain your ranking in class.

1.

2.

3.

4.

5.

STUDENT HANDOUT

HOW TO TRAIN YOUR ALGORITHM

The Cold Start Problem

Optimization goals are just half of how algorithms make decisions about what to show you.

The other half is your **inputs**: what the algorithm knows about you.

There are two kinds of inputs: *explicit* and *implicit*.

Explicit inputs are ones you *know* you are giving to the algorithm.

Implicit inputs are ones you *don't* know you are giving it.

Take a look at the examples below and sort them into explicit inputs and implicit inputs.

- Commenting on a video
- Last video watched
- Clicking or tapping the Like button
- Your watch history
- Your search history
- How long you watch a video

IMPLICIT INPUTS	EXPLICIT INPUTS

STUDENT HANDOUT

HOW TO TRAIN YOUR ALGORITHM

Red-teaming Recommendations

A "red team" is a group that tries to guess what might go wrong with a plan. To do this, they brainstorm every *problem, risk* or *drawback* they can think of.

You are going to do a red team exercise to find the possible risks of one of the optimization goals just talked about:

- **Watch time:** Trying to make users watch as much of each video as possible.
- **Engagement:** Getting users to Like, comment on and reply to as many videos as possible.
- **Stickiness:** Trying to make sure that users keep watching videos instead of leaving the platform.
- **Virality:** Encouraging users to share the videos they watch with as many people as possible.
- **Daily active use:** Encouraging users to share the videos they watch with as many people as possible.

Take a few minutes to write down every possible *problem, risk* or *drawback* of this optimization goal that you can think of.

STUDENT HANDOUT

HOW TO TRAIN YOUR ALGORITHM

How to Train Your Algorithm: Questions

Watch the video How to Train Your Algorithm (http://tiny.cc/trainyouralgorithm) and answer these questions:

How do algorithms decide what to show you?

a) They make guesses based on what they know about you
b) They make guesses based on what they think they know about you
c) They show you what they want you to watch
d) They always show you the most popular videos

What does the video suggest as a first step to train your algorithm?

a) Watch more videos
b) Start from scratch by using privacy settings
c) Share more content
d) Create multiple accounts

What's the biggest benefit of training your algorithm?

a) It helps content creators get more views and followers.
b) It reduces the amount of data collected about your online activity.
c) It ensures that you are only shown content that aligns with your values.
d) It increases the likelihood that you will be shown things you like

How does watching a video all the way to the end affect the algorithm?

a) It signals that you want to see more content like that
b) It has no effect on the algorithm
c) It tells the algorithm to show less of that content
d) It confuses the algorithm

STUDENT HANDOUT

HOW TO TRAIN YOUR ALGORITHM

How to Train Your Algorithm: Answers

Watch the video How to Train Your Algorithm (http://tiny.cc/trainyouralgorithm) and answer these questions:

How do algorithms decide what to show you?

a) They make guesses based on what they know about you

b) They make guesses based on what they think they know about you

c) They show you what they want you to watch

d) They always show you the most popular videos

What does the video suggest as a first step to train your algorithm?

a) Watch more videos

b) Start from scratch by using privacy settings

c) Share more content

d) Create multiple accounts

What's the biggest benefit of training your algorithm?

a) It helps content creators get more views and followers.

b) It reduces the amount of data collected about your online activity.

c) It ensures that you are only shown content that aligns with your values.

d) It increases the likelihood that you will be shown things you like

How does watching a video all the way to the end affect the algorithm?

a) It signals that you want to see more content like that

b) It has no effect on the algorithm

c) It tells the algorithm to show less of that content

d) It confuses the algorithm

STUDENT HANDOUT

HOW TO TRAIN YOUR ALGORITHM

Algorithm Training

Now you can try training one of your apps to show you just one thing.

Here's how you make different apps and platforms forget what they know about you:

TIKTOK

- Start by going to your profile
- Tap or click the three lines at top right
- Click or tap Settings and Privacy
- Click or tap Content Preferences
- Select Refresh Your For You Feed
- Click or tap Refresh.

INSTAGRAM

- Tap your profile icon (bottom right of the screen)
- Tap the menu icon (the three lines at the top right)
- Click or tap Content Preferences
- Click or tap Reset Suggested Content
- Click or tap Next, then Reset Suggested Content

YOUTUBE

- Go to Myactivity.google.com
- Click or tap YouTube History
- Click or tap TURN OFF

Now you can start to consciously retrain your algorithm:

Try to get the app to only show you one kind of content – all cat videos, for example.

- How long does it take?
- What works better – liking videos, watching them all to the end, or something else?

If it gives you options for negative feedback, like "Not interested" or "Don't recommend" buttons, test how well those work at weeding out the content you don't want to see.

STUDENT HANDOUT

HOW TO TRAIN YOUR ALGORITHM

Reinventing Recommendations

You've learned what you can do now to train the algorithms that apps already use.

Now let's think about how those algorithms should work.

Write down either a type of app (for example, a video app, a social network, or a search engine) or an app that already exists (YouTube, Instagram, Google, etc.):

Then:

OPTIMIZATION GOALS

Write down at least three optimization goals you think the algorithm should have. These do not have to be optimization goals we talked about in class.

1.

2.

3.

Rank these optimization goals by weight (how important they are to the algorithm's ranking.) For each goal, explain why you chose it and why you gave it that rank.

1.

2.

3.

Next:

INPUTS

Write down at least three inputs you think the algorithm should pay attention to. These do not have to be inputs we discussed in class. They can be any way that a user can send information to the algorithm. For each one, identify whether it is an explicit or an implicit input and explain why you think the algorithm should pay attention to it.

1.

2.

3.

